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Coking and Chemical Research

THE coke oven industry is in some respects unique as having one foot in the chemical industry and one in the coal industry; if it were of Manx origin we should say that its third foot was in the iron and steel industry. From the proceedings at the annual meeting of the Coke Oven Managers' Association last week and the speeches at the dinner, there emerges the interesting fact that the industry is taking definite steps towards setting up a research organisation. There are certain bodies charged with the prosecution of coke research, but these bodies largely operate upon lines that will advantage the metallurgical industry and do not touch the problems of those who are finding less and less scope for their principal product in that market. Mr. T. Westthorp's presidential address was largely devoted to pressing the advantages of research upon the members, and the principal guest of the evening, Sir Cecil Cochrane, gave the proposal the full weight of his support. The method by which such an organisation is to be started and conducted is full of interest and will obviously demand the greatest care. At present two suggestions are made. One of these is the obvious one that a fully equipped research station should be fitted up. This proposal has against it the difficulty of expense. It is impossible to carry out convincing research into by-product coking other than on the works scale. It would be equally difficult to select one type of oven construction for the purpose and to omit all other types. The net result could only be a very expensive plant costing not less than perhaps £50,000. Even this is not all. Coke ovens vary considerably in width between 8½ in. and 21 in. They vary equally in height and to a less extent in length. The dimensions of an oven fundamentally affect the character of the products made therein. It seems difficult to believe that this branch of the chemical industry can afford to build a research station that will include every type of plant; anything less than this might seriously diminish the usefulness of the work. The second suggestion is that owners of works should put one or two ovens at the disposal of the research staff whenever desired, any losses thereby entailed being made good from a central fund. At first sight this suggestion seems much better, but it has disadvantages, one of which is that the research staff, being wanderers upon the face of the earth, would not be likely to be as successful as they would be if the researches could be conducted under settled conditions, particularly since the average coke oven laboratory is not renowned for the extent of its equipment nor its spaciousness.

Following the dinner, and most appropriately after the research bias of the presidential address, the

Association visited Professor G. T. Morgan and his staff at Teddington. The Chemical Research Laboratory is well worth a visit from every chemist. A wide range of researches is being conducted, ranging from the more abstruse organic compounds to pure inorganic research, the majority of the subjects under investigation having a purely industrial interest. Professor Morgan and his staff appear to have found that happy blend of scientific devotion with industrial foresight that alone can carry such an organisation to success. Sufferers from sleeping sickness in Africa are being provided with new series of arsenical atoxyl derivatives for the better treatment of their disease; the roads of the country are being improved, or at least the surfaces modified, by the investigations of the road tar section, a section which, by the way, has obtained some highly intriguing results with rubber-tar oil solutions; microscopic organisms are being coaxed to produce new chemicals otherwise difficult or expensive to manufacture; the corrosion of metals in the air and under water is being followed; new plastic materials are in course of production—the coke oven managers being specially interested in the direct production of synthetic resins from the phenols of low temperature tar without prior isolation of the phenol. The high pressure section is especially interesting since there are being investigated these important reactions between carbon monoxide and hydrogen that may one day be the source of our liquid fuel and simpler organic acids.

It was a good joke to suggest that 100 tons of gas-works flue dust might contain gallium worth £1,500,000; we can imagine some enthusiast taking Professor Morgan seriously and finding when he had prepared a little gallium that the price had dropped overnight like a meteor from its present value of three guineas a gram. Those of our readers who are concerned with tar distillation would be interested to see the experiments upon the corrosion of tar stills, a research that appears to have demonstrated that only some 25 per cent. of the corrosion is due to the usually suspected ammonium chloride, the greater portion being caused by a resinous portion of the tar containing higher tar acids which decomposes in the still presumably with the production of acidic compounds. These bodies are to be found in the greatest extent in low temperature tar, to a somewhat less extent in vertical retort tar, and least of all in horizontal and coke oven tar. Unquestionably the Chemical Research Laboratory is not among the least of our national possessions, even though in comparison with many institutions it has yet to attain to that dignified age that will entitle it to be scheduled as an ancient monument.

Notes and Comments

Testimony to the Trade Press

THE election of Sir Ernest Benn as president of the Advertising Association for the coming year is not only a compliment to a distinguished figure in our public life, but a timely testimony to the estimation in which the trade Press is held. Sir Ernest has created one of the largest trade journal publishing businesses in the world, and he probably takes more pride in the number of his firm's advertising accounts than in any other manifestation of his business activities. His list of contented advertisers runs into thousands, and the regularity of their appearance in his journals attests a performance which advertising in other fields can never enjoy. The effective influence of a paper such as THE CHEMICAL AGE is a service which no other agency can render to the trade, and the Advertising Association has shown a very proper appreciation of the inherent steadiness and growing importance of the trade Press.

Aluminium in Food

DR. G. W. MONIER-WILLIAMS, who is in charge of the chemical laboratory of the Ministry of Health, has rendered a useful public service by issuing his recent report on "Aluminium in Food." Ever since aluminium ware came into widespread use for domestic cooking there has been a mild controversy as to the possibility of danger to health arising from the presence of aluminium in foodstuffs prepared in such vessels. On the one hand it has been contended that the small amount of the metal which might be dissolved or corroded by food might give rise to various ailments; on the other hand these statements have been opposed as being contrary to experience and have been declared by many eminent chemists to be devoid of any scientific foundation whatever. Dr. Monier-Williams finds that while aluminium salts are undesirable as ingredients of baking powders there is no convincing evidence that the use of aluminium vessels has a harmful effect on the ordinary consumer. The amount of aluminium which may gain access to food from aluminium vessels under different conditions is shown to be very small, and it is his opinion that many of the statements as to large amounts being taken up by food must be ascribed to the use of faulty methods of analysis. Common sense must be used in cooking in aluminium. Strongly alkaline materials such as soda will attack it, as also will strong acids, but the pure metal is remarkably resistant to corrosion by acid foods. In general, the amount taken up by foods in this way is far less than the amount which would be introduced into bread by the use of alum baking powder. An extremely small amount of the metal finds its way through the walls of the digestive tract and into the blood and organs of the body, and it is difficult to believe that quantities of the order of one or two parts per million in the body tissues could have any ill effect.

It is possible that there may be individuals who are susceptible to even such small doses of aluminium as may be derived from aluminium utensils, but Dr. Monier-Williams finds that the evidence of this is inconclusive. There are certain cases where

physicians and patients were firmly of opinion that aluminium had been a cause of illness and that benefit had resulted when it was given up. Possibly such cases were due to a genuine idiosyncrasy or sensitiveness to aluminium on the part of certain people. Such idiosyncrasies are well known in connection with certain foods such as fish, milk, etc.

Non-Poisonous Coal Gas

THE paper on rendering coal gas non-poisonous by converting the carbon monoxide into methane, which is summarised on another page, is of peculiar interest both to chemists and to technicians in the gas and allied industries. The process is ingenious and is based on sound chemical principles so far as concerns its technical development. It is open to question, however, whether the expenditure of time and energy upon the work is justified by a need for such a process, and it is still more questionable whether the gas industry will adopt the Fischer-Pichler process described. The frequency with which coroners record a verdict of suicide from coal gas poisoning is not high compared with the death roll of the total population, nor is it the only method by which those who desire to leave the earth can do so. The majority of those who are determined to commit suicide would do so by some other way if coal gas were not available, and in general these other ways are not only more messy and create more trouble for the living, but are frequently more painful for the misguided deceased. It is, therefore, open to question whether on this count, the gas industry would be justified in incurring the expense of removing the carbon monoxide from gas. The proportion of accidental deaths from coal gas poisoning is so small as to be negligible, and becomes positively ludicrous when compared with the motor car, the aeroplane, or even the normal hazards of the home and workshop.

Is it Worth the Cost?

THE cost of the process is far from negligible. The authors of the paper state that, apart from process costs, the volume of the gas is reduced to one-half its initial amount, although the calorific value per cu. ft. is increased. The calorific value of the Berlin gas calculated from the analysis is about 400 B.Th.U. per cu. ft. This is increased to some 612 B.Th.U. by methanisation—an increase of 1.5. As against this there is a volume decrease of 2, making a nett loss of one-quarter of the thermal value of the gas. Can the industry afford to increase its gas-making costs by not less than 25 per cent. to meet a hazard which affects so few people? It would be as apposite to ask the electrical industry to distribute current of not more than 40-50 volts for the same reason. The difficulties go even deeper than this. If a company is distributing gas of 450 B.Th.U., the methanising process may increase this figure perhaps to 650. Only two recognised ways are used for bringing a too high calorific value down—the addition of water gas or of producer gas. Both of these gases depend to a large extent upon carbon monoxide for their heating power; if this is to be removed with formation of more methane, a vicious cycle will be set up leading to greatly increased costs.

Our National Coal Resources

Sir Harold Hartley's Hinchley Memorial Lecture

THE problems of the coal fields are very difficult, but much depends on their successful solution. Great Britain is, and must remain, a coal country; we owe our prosperity largely to our coal, and the maintenance of our industrial position will depend in no small measure on our continuing to utilise to the best advantage both technically and commercially the great resources with which nature has endowed us. In these words Sir Harold Hartley, F.R.S., summed up his address on "Our National Coal Resources" before the Institution of Chemical Engineers on October 25. Sir Harold was delivering the second Hinchley Memorial Lecture of the Institution and the keynote of his address was "better organisation within the coal industry and more research."

Our post-war experience had certainly shown the danger of optimistic forecasts of an expanding export trade, said Sir Harold, and it looked as if the time when Great Britain's coal reserves were likely to approach exhaustion lay far distant in the future. Still, in looking forward we must remember that the costs and difficulty of production must increase as the more accessible seams were worked out, and it was essential that we should utilise our resources with economy and to the utmost advantage. Great Britain was fortunate in possessing coal reserves of high quality and great diversity of character, but estimates of our resources, which were on a purely quantitative basis and bulked together the reserves of different types, gave a very incomplete picture and might, in fact, give a quite misleading sense of security unless the reserves were equally suitable for all purposes. This was not the case, and the tendency of modern industry with coal, as with other materials was to demand supplies to a definite specification suited to the purpose for which they were intended. Therefore a more detailed survey of our resources was required.

Progress of the Coal Survey

The progress of the Coal Survey was necessarily rather slow, said Sir Harold, but already 35 reports have been published on various seams, and the main investigations would be completed within ten years. As the work of the Survey progresses, its value is becoming more and more obvious. It provides for the first time an accurate chart of the coal resources of the country. It tells the collieries the exact nature of their products and the variations in quality from point to point, thus helping their rational development. It tells the consumer where he can obtain the particular types of coal he requires. It gives information as to the best sources of coal for special purposes, such as hydrogenation and low temperature carbonisation. It facilitates the choice of coals for blending. It indicates the best method of cleaning coal from particular seams. In fact it is fulfilling the purpose for which it was founded, "to promote the better utilisation of the national coal resources."

In one important respect the Survey was incomplete. Hitherto no attempt had been made to estimate the extent of our reserves of coals of different types, and in spite of their vast extent as a whole, we ought to know, for example, whether the supplies of the coals suitable for metallurgical purposes were adequate, in view of their importance to the iron and steel industry. At present they are being used to an increasing extent for making domestic coke and we should know whether there was any necessity on national grounds to conserve them for the purpose for which they were essential.



Brigadier-General Sir Harold Hartley, F.R.S., vice-president of the L.M.S. Railway, who delivered the second Hinchley Memorial Lecture to the Institution of Chemical Engineers.

"Has not the time come when the Survey should be utilised to examine this vital question?" asked Sir Harold.

Even if this country's manufactures once again were of pre-war type and volume, the consumption of coal would still remain substantially below its former level. The causes of this change could be quickly illustrated. Nearly 15 per cent. less coal was required to produce a ton of pig-iron to-day than in 1913. Fuel economy had been estimated to save the iron and steel industry £4,500,000 a year, the cost of more than 6,000,000 tons of coal. Seventeen years ago 3.47 lb. of coal were used to generate a unit of electricity; in 1933 only 1.65 lb. were necessary. The gas industry had increased its output by 60 per cent., but its consumption of coal had only risen 10 per cent. The substitution of gas and electricity for the domestic use of coal had a further unfavourable reaction on the coal industry, since lower-priced grades of fuel could be used in these processes. The new power station at Swansea, for example, was to burn anthracite duff, hitherto an almost unsaleable commodity.

Post-War Problems

During the post-war period the coal industry had therefore had to face a difficult situation as a result of a contracting market, increased competition, and a demand for improved quality of coal. Until 1913 comparatively little progress had been made in the modernisation of coal mining in this country, but under the stress of post-war conditions, mechanisation had proceeded apace, and by this means the coal industry had reduced costs of production to a remarkable degree. In fact mechanisation was leading to a review of every branch of mining technique. Power had come to the mine and brought with it improvements in ventilation and lighting and in the conditions and safety of those working there. Even if the British coal industry did not dominate the world market as it did before the war, it was still responsible for about 20 per cent. of world production and for about 40 per cent. of world exports. It held its position to-day largely through the reduction of costs by mechanisation.

In contrast to the improvement in methods of mining, there had been little change in the methods of distribution and selling of coal, particularly in the domestic trade, and there was here an extensive field for joint investigation from the mine to the cellar on the part of the producing, carrying and retailing interests. Existing methods tended to a multiplication of facilities and supplies and retarded the develop-

ment of reorganised and more economical systems of handling and transportation. The position was still further complicated by the widespread system of private ownership of wagons which had involved the railway companies in the provision of extensive accommodation and facilities for the purpose of sorting both loaded and empty wagons.

In striking contrast to the long and important industrial history of coal, it was only comparatively recently that the problem of its chemical nature had been seriously attacked. When they consider the magnitude of the scientific problem and its manifold significance for industry the need for widening the front of attack and increasing its intensity was obvious. He was often asked, what would be the use of this research? The answer was that if they knew, the research would be unnecessary. It was impossible to say how the extension of knowledge would prove most useful, but they knew that the

phenomenal progress of recent times had only been made possible by the successive advances of science, and coal would be no exception to the rule. "More research, better organisation" summarised in four words what appeared to him to be the factors that would contribute most to the better utilisation of our coal resources. They had watched the recent tendency of industries towards concentration into large units. Whether they liked it or not, there were compelling reasons for the formation of these large units to meet modern conditions of competition and development. For a historic industry that had developed naturally in a number of separate units, the transformation must be difficult, with its apparent disadvantages of loss of control and loss of individuality. But was not the real problem of business organisation how best to give the advantages of large scale management while preserving the individuality of the constituent parts?

Methanising Carbon Monoxide and Dioxide in Coal Gas

Rendering Town Gas Non-Poisonous

INVESTIGATIONS having an important bearing on the question of rendering town gas non-poisonous are described by F. Schuster, Gunter Panning, and H. Bülow, of the Gesellschaft für Gasentgiftung G.m.b.H., in "Brennstoff-Chemie," October 1, 1935.

F. Fischer and H. Pichler, by using a nickel-aluminium catalyst, on a suitable carrying medium, experimented in methanising both oxides of carbon in the presence of excess hydrogen. As the result of their work they found (1) that the presence of carbon dioxide in the gas mixture had no kind of influence on the hydrogenation of carbon monoxide to methane, and (2) that the hydrogenation of carbon dioxide in a gas mixture containing also carbon monoxide, did not proceed until all the carbon monoxide had been hydrogenated. The same investigators showed, however, that different results were obtained by different catalysts of the same type, and that with some of these the products were largely liquid. The authors supplemented this work of Fischer and Pichler, using a number of nickel catalysts placed at their disposal by Professor Mallison, and obtained valuable additional information on the methanisation in gas mixtures containing the carbon oxides and hydrogen. Berlin town gas was selected for the gas mixture and this had a composition within the following limits:—

Carbon dioxide ...	% 3.0-4.7	Carbon monoxide ...	% 13.6-16.7
Heavy gaseous hydrocarbons ...	2.0-2.6	Hydrogen ...	45.8-52.0
Oxygen ...	0.0-0.7	Methane ...	16.7-19.5
		Nitrogen ...	8.8-14.0

The gas was subjected to the water gas catalysis by activated iron oxide at 450° and steam, which altered the composition to:—

Carbon dioxide ...	% 12.0-14.0	Carbon monoxide ...	% 2.4-3.8
Heavy gaseous hydrocarbons ...	1.7-2.4	Hydrogen ...	50.8-56.7
Oxygen ...	0.0-0.7	Methane ...	15.0-17.7
		Nitrogen ...	8.0-13.0

The gases were cooled, freed from hydrogen sulphide in the usual way, and from organic sulphur by catalytic decomposition of the same in an active carbon tower, and were then conducted over the nickel catalyst in an electrically heated furnace. The sulphur content was reduced in the purifying to 0.45-0.54 grams per 100 cu. metres. The purified gas mixture was then subjected to the methanising treatment. Up to temperatures of 240°-250°, only the carbon monoxide was hydrogenated to methane, thus confirming the observations made by Fischer and Pichler; from this temperature onwards, the end-gas was free of carbon monoxide. As the temperature was increased above this point, carbon dioxide began to

be hydrogenated to methane. The composition of the gas mixture at temperatures of 250° and 400° was as follows:—

	250° %	400° %		250° %	400° %
Carbon dioxide ...	15.6	10.0	Methane and Homologues ...	23.5	57.0
Carbon monoxide ...	0.0	0.0	Nitrogen ...	10.1	18.4
Hydrogen ...	50.8	14.6	Contraction ...	13	49

In the presence of one contact, consisting of nickel and oxides of aluminium and magnesium (K-10: 10 per cent.), carbon monoxide and carbon dioxide were simultaneously attacked without complete conversion of the carbon monoxide. The results obtained at temperatures ranging from 300° to 400° at 25° intervals were:—

	300° %	325° %	350° %	375° %	400° %
Carbon dioxide ...	14.2	13.7	12.7	11.8	10.2
Carbon monoxide ...	2.3	1.9	1.8	1.6	1.0
Hydrogen ...	51.1	48.2	42.2	33.4	27.3
Methane, etc. ...	19.8	23.7	28.8	35.7	42.2
Nitrogen ...	12.6	12.5	14.5	17.5	19.3
Contraction ...	5	12	20	29	34

When the carbon dioxide was removed by washing the gas mixture with a potash solution before methanising the carbon monoxide in the same temperature range, the carbon monoxide was completely converted to methane, which proved that with this contact, the presence of carbon dioxide was unfavourable to the conversion of the carbon monoxide.

A second catalyst, consisting of nickel with 1.5 per cent. thorium oxide and a suitable carrying medium (K-12: 10 per cent.), showed greater activity in so far as it operates at lower temperature and attacks carbon monoxide and carbon dioxide simultaneously, but compared with the previously named catalyst, it furthers the conversion of the carbon monoxide more strongly, as is shown by the analyses of end-gases:—

	215° %	250° %		215° %	250° %
Carbon dioxide ...	11.3	8.6	Methane ...	36.4	57.9
Carbon monoxide ...	1.0	0.0	Nitrogen ...	17.4	23.2
Hydrogen ...	33.9	10.3	Contraction ...	28	47

Compared with catalyst K-10, the preferential conversion of the carbon monoxide under otherwise equal conditions is unmistakable. The ratio of carbon monoxide to carbon dioxide, and the amount of the hydrogen excess with which to methanise the gas mixture, are of influence on the course of the reactions. On the whole, the methanising of coal gas of the average composition of town gas, results roughly in halving the volume, but very considerably increasing the calorific values, as, volume for volume, the lower heat value of methane is about 3.33 times that of the lower heat value of hydrogen.

A Petrol Joy Ride

A Leading Scientist Sums Up His Impressions of Billingham

NEVER was such joy-riding before: to see a Peter Piper pick a peck of petrol—from old King Coal, an old soul that can be either merry or maleficent, according to the kind of shiver that is given to his primeval timbers: whether the energy stored up in his old bones be directed to good or to evil end: to warm our hearts or inflame our passions. However much Middlesbrough may have muddled its iron industry in recent years, however lacking in vision and sound management, however drab the district, the evidence was there, on the occasion of the recent invasion of the town by the flying forces of Imperial Chemical Industries, that a saving element of imagination, shown in its high sense of colour, is now at work. *Scientia vincet.*

Visitors to a new Wonderland, the party was properly ushered in through Fairyland—for no other name than Wonderland can be given to a region in which grimy coal is transformed into the most mobile of clear colourless fluids, the sole remunerative use of which, three-quarters of a century ago, was in unsoiling dancers' dirtied white-kid gloves: a liquid now the ruling locomotive force of the world, truly a kind of "bottled sunshine" such as even a Swift cannot have foreseen. Armed from London with an "Open Sesame" in the form of first-class return tickets, distributed and labelled with indescribable foresight, led by instructions of fourth-decimal-point directness, a short distance from the stable where we had been deposited from eight diners by our rocking, swift running, iron steed, we entered nominally into the Town Hall. Actually, by some magic catalytic change, we found ourselves with Sinbad, in a wonderfully illumined chamber, throbbing with colour, a specially exquisite feature being a great central lantern glazed with glowing red and celestial blue. Here we were not merely cold-collared but even served with hot pheasant in *casseroles*. Properly speaking, such a body should have been fed upon catalysts: no gross foods should have been allowed at the feast of reasoned inquiry in prospect.

The Conquering Hero Comes

Gross needs were perhaps better met by substituting *Chambertin* and Champagne was to come later on in the day. Had not certain organ-fittings been left undisguised, the illusion would have been complete: particularly if these had been used to pipe "See the Conquering Hero Comes," as Sir Harry McGowan led in Dr. Bergius. We should have imagined ourselves upon the stage, taking part in an ultra-perfect transformation scene—the wedding of Prince Water-stuff with Cinderella Kohl.

Mr. Ramsay MacDonald should have stepped there and then into Harlequin's clothes and slapped us all with the vivid wand of scientific imagination. To speak of dull defence by armaments, of using more coal, of giving more employment, may have been politic: the defence to be derived from use of knowledge and by free exercise of thought would have been more appropriate subjects. What has been made out of coal in colour—its value as our fundamental food-producing agent—our inefficient use of the sunshine congealed in its substance—our deplorable inability to do otherwise than quarrel over its production and sale—our almost universal ignorance of its nature: all these were topics upon which it would have been politic to enlarge. Seaham forbade. Not even a Lord President of the Council could be expected to serve two such masters at one time. Still, it was right that the official head of our State scientific service should have

pronounced the blessing on the magic transformation effected at Billingham. No other member of the Government stands so near to natural science. Not only is Mr. MacDonald an F.R.S. *Honoris Causa*. In early days, his red tie was regularly seen at Royal Institution Friday evenings and he married the daughter of Dr. John Hall Gladstone, an active physical chemist in the middle Victorian period, joint inventor with Tribe of the zinc-copper couple, one of the earliest used, simplest and most effective of hydrogenising agents he was also a worker in the terpene field. Far more valuable was the pioneer service he rendered to elementary education on the London School Board. A real

beginning was made, under his loving care, in the eighties, in giving effective practical training in the elements of scientific method. He has had no successor. The subject died out in schools at his death. The sometimes inestimable value of the single life was never more clearly shown. Mr. MacDonald might do far higher service than he can possibly ever render as politician if he

were to take up the parable, now hanging in the void, of his late father-in-law: he holds the public ear and could advise with effect. He told us nothing of the wonders that Billingham was disclosing. Still, by some happy stroke of local genius, colour was given to the occasion and a frame of mind engendered which enabled most to do honour to the occasion, to evaluate with some measure of artistic feeling and sympathy the greatness of the achievement sensed during our round of the works, for nothing could be seen, except a most orderly but entirely bewildering forest of plant.

The Last of Four Great Achievements

The spaciousness, the spick-and-spanness of the lay-out must have been more than astounding, especially to anyone there who could look back to the careless conditions of confusion which formerly prevailed in the long defunct alkali industry on the Tyne—killed by the genius of the destroying angel, Ludwig Mond, to whom indeed Billingham is itself genetically related. The marks of his spirit are everywhere. The hydrogenation of coal is the last of four great modern achievements in chemical engineering, beginning with the manufacture of indigotin artificially, passing to the extraction of nickel as nickel carbonyl, then to that of nitrogen from the air as ammonia. These have all been straightforward tasks, involving well-defined and well-understood chemical interactions. No one, however, could have believed, until it was an accomplished fact, that coal would fall to pieces in the way and with the ease it does in face of hydrogen. This in itself is a most astounding discovery: we begin through it, for the first time, to have some real understanding of the coal substance. No praise is too great for the enterprise and skill behind the work. The experiment is one that had to be made. What the final economic result will be, experience extending over several years alone can show. The process so absolutely involves nothing but carrying coals to Newcastle: the addition of one combustible to another combustible, merely to give the one fluidity.

That a petrol so made can ever compete with the natural product is not conceivable: the industry would always need to be subsidised. The capital outlay is colossal and difficult to justify—it is more than probable that, in the not distant future, we shall be called upon rather to use our money to support agriculture as an industry, in the ordered food service of the country. Not only may simpler syn-

One of the principal guests at the recent opening of the coal hydrogenation petrol plant at Billingham by Mr. Ramsay MacDonald sends us these impressions of the visit and of the gigantic experiment which the new enterprise represents. As an experiment the process is wonderful; is it even a gamble?

thetic methods of making oil be found but we have to look forward to the discovery of direct means of using coal in place of oil. It is in this direction that organised inquiry is most needed. We cannot disguise the fact that the production of petrol from coal is a sensational achievement, the industrial answer to what appeared to be a challenge. This is true also of the manufacture of indigotin artificially and of ammonia from the air: both can be effectively made

by natural agencies. When the craze to manufacture becomes less insistent, we shall probably once more turn our attention to Nature, the dear old Nurse: she must already be rather inclined to slap the child upon her knee for his inconsiderate worship of machinery and his inattention to her own wonderful ways. We trust that a complete account of the way in which the invention has been worked out in all its details has been placed upon record—for ultimate publication.

New Dyestuffs

Five New I.C.I. Products

CHLORAZOL FAST YELLOW 6GKS is greener and a little brighter in shade than the already-established Chlorazol Fast Yellow 5GKS and possesses better water solubility. It has very good affinity and level dyeing properties and, in addition to its value for the dyeing of cotton, it is equally suitable for application to viscose artificial silk, on which fibre it is of particular interest for producing even shades on material of irregular quality. Chlorazol Fast Yellow 6GKS is of interest for the dyeing of tapestries, upholstery and the cheaper types of casement curtain materials, where light fastness is of primary importance. It withstands the vulcanising treatment and is thus suitable for the dyeing of materials which subsequently have to be rubber-proofed. It is of interest for the production of fast to light greens in conjunction with Chlorazol Fast Blue 7GKS and also as a component in other mode shades. It is suitable for filling in the cotton at low temperatures in cotton-wool unions.

DURANOL NAVY BLUE G POWDER is designed for use as a basis for navy blue shades and is of special interest for application to delustrated acetate silk, more especially to the pigment delustrated type, on account of its good fastness to rubbing. The heavy percentage of dyestuff required in the production of full shades of navy blue on pigment delustrated acetate silk is liable to lead to looseness to rubbing, but the use of Duranol Navy Blue G reduces this tendency to the minimum. The general fastness properties of this new product can be described as good and its dyeing properties are such that it is applicable to all types of acetate silk materials and is suitable for use both on the jig or winch.

LISSAMINE FAST YELLOW AES is of particular interest on account of its excellent levelling properties combined with very good affinity and light fastness. A point to be noted with regard to the light fastness of this product is that after the initial change, in which the tone becomes browner without any loss in depth, the fastness to light becomes excellent. The levelling properties are such that it can be employed as a salting-on colour to yield highly satisfactory results. This new dyestuff produces brownish-yellow shades on woollen materials and is of good general fastness. Special attention is drawn to its suitability for the dyeing of felt hoods, ladies' dress goods, both knitted and woven, upholstery and pile fabrics, carpet, hosiery and knitting yarns. Where it is desired to leave cotton or viscose effect threads white, this dyestuff is very satisfactory. It may also be applied to natural silk from a formic acid bath, and to jute, coir and wool skins. It is not recommended for direct printing or discharge purposes.

DURANOL GREY 2B and DURANOL BROWN B have been specially designed for use as the basis of greys, fawns, drabs and browns and for the production of mode shades generally. Duranol Grey 2B is eminently suitable for use as a general flattening agent. Both products are characterised by maintaining the same tone through varying dyebath temperatures and are suitable for application on both jig and winch. The general fastness properties of Duranol Grey 2B and Duranol Brown B can be described as very good, while their balanced dyeing properties make them extremely useful products for application to all types of acetate silk materials.

Hathernware Chemical Stoneware

Plant for the Storage of Acid in Bulk

AN installation for bulk storage of hydrochloric acid, using large size stoneware containers, has recently been completed by Hathernware, Ltd., of Loughborough.

The illustration shows the plant erected at the company's Hathern works for inspection and testing before despatch to the customer's works by road transport.

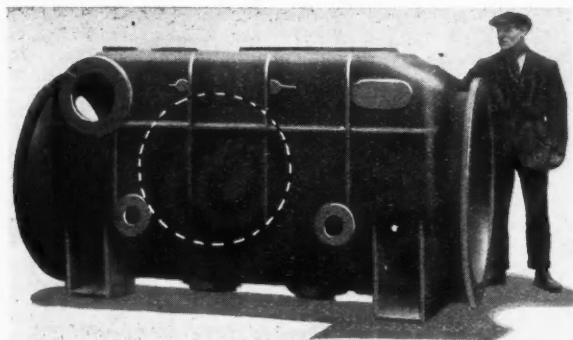
The two storage vessels each hold 3,000 litres, giving a total capacity for storage of 6,000 litres, or 1,320 gallons. All the piping is of the cone-ended type, and is supplied complete with the iron couplings. Each vessel is fitted with a special indicator pipe to show the level of the liquid.



Welding in Chemical Plant Repairs

By C. W. BRETT, M.I.E.E. (Managing Director of Barimar, Ltd.)

THERE are probably few industries in which welding is used to such an extent as in the chemical industry. In normal constructional engineering so long as the requisite strength is forthcoming little else matters, for protection against atmospheric corrosion is easily achieved by painting. In the chemical industry, however, much more is required; vessels must be constructed capable of withstanding high pressures, the corrosive effects of acids and gases, sometimes coupled with intense heat. As a consequence of these requirements it is necessary to use special alloys of which stainless steels and Monel metal come particularly to mind.

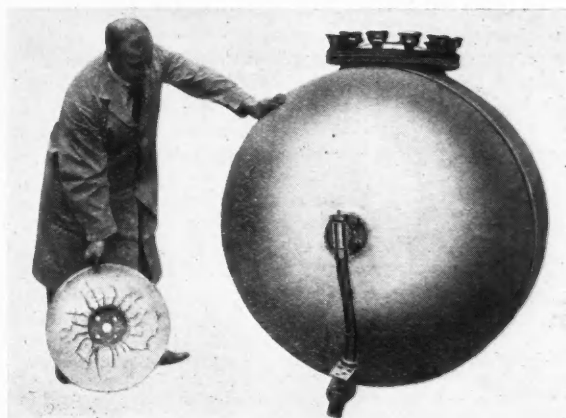


Porosity and defects developed in this condenser casing within the area marked by the circle. The casting weighed 2 tons 4 cwt. and measured 12 ft. by 5 ft. by 5 ft. The metal was so bad in places that it had to be cut right out, and new parts cast and welded in. Other less serious defects were welded and the whole casting made perfectly sound. It is a serious matter when a casting of special design like this meets with an accident or proves defective, and a repair by modern scientific welding is of inestimable value in such cases. This piece of plant was required most urgently and the whole of the repairs were carried out within three days. This was not an expensive job; it was covered by a guarantee, and proved entirely satisfactory in use.

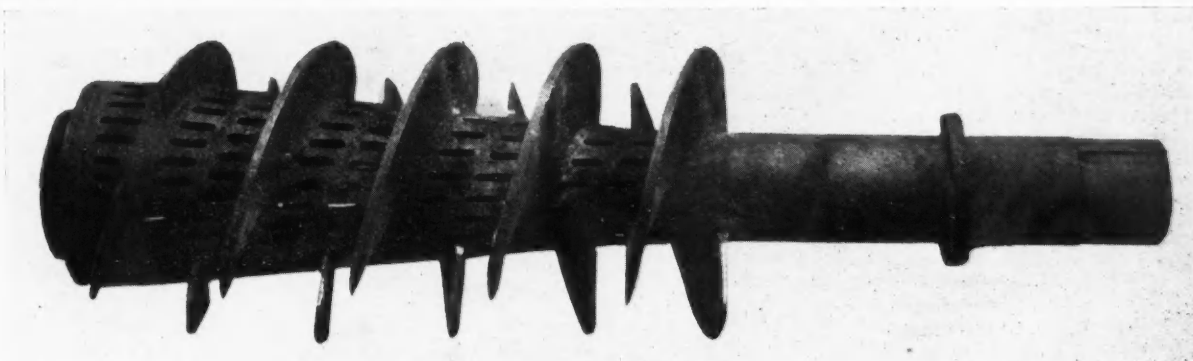
It is very often the case that in addition to the requirements already named it is most desirable to present smooth surfaces, and ledges which follow upon the overlapping of riveted plates cannot be tolerated. There are definite limits to the size of pressed metal work whilst large cast containers are very expensive. The eliminating of these alternatives

leaves welding as the only practical method of production in a large number of cases.

A fundamental necessity is that welded joints must possess identical characteristics to the parent metal; in fact it is not too much to say that welding is the only means by which this requirement can be guaranteed, but it is requirements of this kind that make satisfactory results dependent upon specialists who are possessed of the requisite plant and experience. Much also depends upon the confidence of individual operators, for unlike riveted construction, visual examination is not dependable and in this respect X-ray equipment is invaluable so long as the design of vessel or component allow this electrical equipment to be used. Only experience teaches what is the best welding electrode or rod to use.



Serious corrosion developed in this large aluminium vessel in the vicinity of the outlet connection. All the nature of the metal had been lost, and it would have been futile to attempt to weld up the cracks. A large circular piece was therefore cut out, as shown on the left-hand side of the photograph. A new piece of aluminium was then welded in to take the place of the defective metal, and the outlet connection fitted to it. The aluminium vessel was in excellent condition apart from the one defective place, and when repaired by the method described it was as good as new. It is obvious that this repair cost a mere fraction of the price of a new aluminium vessel, and it is typical of the kind of repairs that can be carried out to aluminium vessels of all kinds.



This is a ram or spindle of a special type used for pulverising vegetable matter; it is 14 ft. long and weighs 2 tons 10 cwt. Owing to the presence of stones several blades on the ram were broken off; these pieces were in turn broken into smaller pieces. A repair by welding was decided upon, but patterns had first to be made in order to cast new pieces to replace the broken ones. These new pieces were welded into place and when the welds had been dressed up there was hardly a trace of repair and the ram was as strong and efficient as a new part. A repair like this to a part of special design often saves the owners 90 per cent. of the cost of a new part

Sometimes the feed rod must be identical with the parent metal, at other times special elements must be incorporated in the flux coating, in other instances the rods must contain an excess of some particular component to compensate for loss which may take place when welding certain metals and alloys. These considerations are equally important in repair work.

A weld is essentially the melting and subsequent freezing of metals, hence the temperature of the parent metal at the time of welding and the rate of cooling, *i.e.*, the speed of freezing, are important. It is not necessary in every case to heat the parent metal before work can be commenced, at least to a high temperature, but it is essential to know precisely what is the critical temperature and subsequently control the rate of cooling. Until quite recently stainless steel presented peculiar difficulties to the welding expert, partly because the operator is not always aware of the specification of the particular steel upon which he is working; the result was that weld decay set in, but to welding specialists this trouble is entirely eradicated thanks to the introduction of materials, which are no longer susceptible to this trouble.

An offshoot of normal welding practice is that which is known as metal spraying. Wire made of the metal it is required to deposit is fed mechanically through the oxy-acetylene flame. Metal deposited by this method forms a perfect bond and by way of example as to its tenacious adherence it may be mentioned that such highly stressed components as engine crankshafts are frequently built up on pins and journals when these parts have become severely worn. An important advantage of metal spraying as it applies to the

chemical industry is the fact that containers and other parts can be made of a relatively inexpensive metal, which may be quite satisfactory from the point of view of strength, but may not possess the necessary chemical characteristics. By means of a metal spraying gun the relatively cheap base may be coated with the appropriate expensive metal to almost any required degree of thickness. Metal spraying is particularly useful as a means to prevent corrosion and recent experiments in this connection have been notable on account of the fact that the resistance to corrosion has been greater than any other metal so far applied.

Apart from the question of corrosion certain parts of chemical manufacturing plant are subject to heavy wear due to abrasive substances which cannot be avoided; pump spindles and shaft bearings are frequently examples of this. When such wear takes place it is a comparatively simple matter for the expert to build up the worn places with new metal and after machining it is virtually impossible, apart from microscopic examination, to see that a welding repair has been completed. Very often the saving in cost is enormous compared with the price of the new component, but in many cases an even greater advantage is the saving in time which results from such methods of repair, for in emergency, work of this nature can be completed in a few hours.

Much of the work which is regarded as commonplace to-day would have been considered quite impracticable so recently as a year or so ago; for example, the Barimar low temperature process for welding cast iron and malleable parts without the need for pre-heating, thus preventing distortion.

Economics of the Synthetic Manufacture of Ammonia—V

The Ammonia Synthesis Plant

These notes were originally compiled in 1918, with the object of providing information necessary to decide whether it would be advantageous to manufacture ammonia synthetically as a commercial proposition in England. They are now published in the hope that they will prove useful to young chemical engineers, in showing the details involved in the preparation of such a scheme.

ON its way to the ammonia synthesis units the gas would be passed over a nickel catalyst supported on pumice (7 per cent. nickel) at about 250° C. The nickel ensures the conversion of all traces of CO in presence of the hydrogen and methane. Nickel is also an active catalyst for the removal of any traces of oxygen, and as it is necessary for neither of these gases to be present to a much greater extent than .001 per cent. the installation of a nickel catalyst at this point would seem to be sufficient to remove both traces of oxygen and CO.

Palladium has certain advantages in respect to the removal of oxygen because it works at a somewhat lower temperature and has a longer life. It might, therefore, be found necessary to install a palladium, as well as a nickel, catalyst, and space should be allowed so that the small container required for the palladium catalyst could be installed if need be after the nickel catalyst.

It appears from experiment that at a pressure of about 80 atm. about 100,000 to 300,000 cu. ft. of gas can be passed through per cu. ft. of catalyst with complete removal, so far as it is possible to detect the presence of CO and oxygen. As in this case at a normal pressure we are passing at a maximum 143,000 cu. ft. there would be required about 1 cu. ft. of catalyst. Suppose a speed of 15 ft. per second through the catalyst is chosen the gross area required would be:—

$$\frac{143,000}{150 \times 3,600 \times 15} = .0176 \text{ sq. ft.}$$

The net area would therefore be $\frac{.0176 \times 100}{7.75} = 0.226 \text{ sq. ft.}$

or a diameter of about $6\frac{1}{2}$ inches.

It is therefore proposed that two bombs or steel cylinders measuring externally about 3 ft. long x 1 ft. dia. and internally containing a space for the nickel catalyst about

6 in. in dia. and 2 ft. 3 in. long should be installed. Three such bombs arranged in parallel would suffice, two being in use at a time. Each bomb would be lagged internally and within the lagging round the catalyst containing would be electric heating (nichrome wire would be wound).

A concentric external interchanger would be arranged in connection with the bombs and in series therewith, similar to those in use with the ammonia synthesis bombs to be described.

Any carbon bisulphide present in the gas which had not been converted by the previous catalysts in the hydrogen plant would be converted to H₂S by the nickel catalyst and would subsequently be absorbed by soda lime. The nickel catalyst itself would absorb a small proportion of the H₂S, which, if present in any quantity, would destroy the activity of the catalyst. It is hardly conceivable that there would be any present at this stage.

After passing this final purification the gas enters the synthesis circuit, which consists first of the cylinders containing lime (or other drying agent), then the "bombs," followed by the scrubber for removal of the ammonia by solution in water, and finally by the circulation pump.

For the purposes of these notes it is thought that a bomb of 25 inches internal diameter with a partial internal interchanger consisting of a spiral concentric tube placed in conjunction with an external interchanger would be the most satisfactory type to install in the first place in any future plant, and the following figures apply to such a system:—

Size of catalyst grain— $\frac{1}{4}$ in.

Nature of catalyst—50 per cent. molybdenum.

Surface per cu. ft.—142 sq. ft.

Velocity of gas through catalyst—35 ft. per second.

Free area through catalyst—0.0342 sq. ft.

Diameter of container—9 inches.

Volume of gas entering catalyst— $0.0342 \times 35 \text{ in.} = 0.096 \text{ cu. ft. per sec. at } 600^\circ$
and $150 \text{ atm.} =$

$$\frac{1.196 \times 150 \times 293}{873} = 60 \text{ cu. ft. per sec. @ } 20^\circ \text{ and}$$

1 atm. pressure = 216,000 cu. ft.
per hour @ $20^\circ \text{ C. and normal}$
pressure.

In order to obtain a percentage on ammonia varying between 3 per cent. for a fresh catalyst and 2 per cent. for a spent catalyst it has been found necessary in the experiments to circulate at a speed of about 125,000 cu. ft. per hour over such surface as would be given by 1 cu. ft. of catalyst: so that for 216,000 cu. ft. 1.73 cu. ft. of catalyst would be required. The gross area of the catalyst container would be 0.442 sq. ft. Lengths of catalyst would therefore be 3.92 ft. or, say, 4 ft.

Assuming the lower percentage 2 per cent., then the weight of ammonia produced is 3.9 per cent. for the total weight of the issuing gases and 60 cu. ft. of the mixed gases. Waste = 1.326 lb.

The quantity of ammonia produced per bomb = $1.326 \times 0.09 \times 3600 \times = 186 \text{ lb. per hour} = 2 \text{ tons per day.}$

At a space velocity close to that given above, viz., 132,000 cu. ft. per hour per cu. ft. of catalyst, it has been found that 1.45 lb. of ammonia are produced per sq. ft. of surface per hour, while on the above calculation as we have a production of 186 lb. per hour from

$$\frac{186}{1.45} \times 3.92 \times 0.442 = 246 \text{ sq. ft.}$$

the quantity produced would only be

$$\frac{186}{246} = 0.756 \text{ lb. per sq. ft. of surface per hour.}$$

The provision of catalyst therefore appears to be ample.

Taking a mean figure of about 1 lb. of ammonia per sq. ft. of catalyst surface per hour, then for the production of 186 lb. of ammonia per hour we should require

$$\frac{186 \text{ sq. ft. of catalyst surface, or}}{142} = 1.31 \text{ cu. ft., i.e., a length of } \frac{1.30}{0.441} = 3 \text{ ft.}$$

The catalyst space will be considered to be cylindrical and to measure 3 ft. long \times 9 ft. diameter. The surface per cu. ft. of gas per second measured at 150 atm. and 600° C. would then be 157 sq. ft.

The output required = 26.4 tons of ammonia per day = 1.1 tons per hour.

$$\text{Number of bombs required would therefore be } \frac{26.4}{2} =$$

13.2, or, say, 15.

Three groups of five bombs each could be installed for this service and for the whole plant a spare group of five could be furnished. Each group would then correspond to one compressor unit, and probably one bomb per set could be out of action and act as a standby for its group.

The volume of gas entering the system is 3,440,000 cu. ft. per day = 143,000 cu. ft. per hour at $20^\circ \text{ C. and normal}$ pressure = 952 cu. ft. per hour at $20^\circ \text{ C. and } 150 \text{ atm.}$

Expressed in terms of ammonia this becomes

$$\frac{952 \times 80}{100 \times 2 \text{ vols.}} = 380 \text{ vols. of ammonia at } 150 \text{ atm.}$$

$$\frac{380 \times 150 \times 17}{385} = 2,515 \text{ lb. per hour or } 26.9 \text{ tons per day}$$

The volume of gas passing to each group of five bombs is

$$\frac{952}{3} = 317.3 \text{ cu. ft. per hour at } 150 \text{ atm. and } 20^\circ \text{ C.}$$

The volume circulated per set of five bombs at 150 atm. = $5 \times 1.196 \times 3,600 = 21,550 \text{ cu. ft. per hour.}$

In the design of the 25-inch bomb with semi-external interchanger the temperature of the gas leaving the catalyst chamber is taken as 629.5° and the temperature entering heating chamber as 579.5° C. The heat to be transferred in the entering interchanger after the gas enters the bomb at 300° would be

$$(629.5 - 300) \times 1 \times (\text{sp. ht.}) \times 1.326 \times 3,600 = 133,500 \text{ C.H.U. per hour.}$$

With a tubular interchanger with a velocity of 35 ft. per second the rate of interchange has been measured and would be about 300 C.H.U. per sq. ft. per degree per hour.

Calculations have been made for an interchanger consisting of concentric sheathes of pure wrought iron and the transfer coefficient was taken as 250 C.H.U. per sq. ft. per degree per hour. The velocity in this case would only be about 2.3 sq. ft. per second and it is possible that a high rate of transfer heat would not be obtained. Now would it be possible to place a 25-inch bomb such surface as would be required if the gases emerged from the bomb at about 350° ?

In the case of the first group of bombs for the first unit to be installed it would seem advisable to instal the tubular system, and make arrangements so that this could be replaced by the sheathe system if the tubular system for some reason gave trouble. It would certainly be more difficult to repair the tubular system should blockage or bursts occur in the tubes, but such a difficulty should not be encountered.

The surface required would be

$$\frac{133,500}{(say) 250 \text{ C.H.U.}} = 107 \text{ sq. ft.}$$

In such a case the walls of the bomb would be at a temperature of between 300° and 350° .

The gases leaving the bomb would pass through at 30 ft. per second a connection pipe about 2 in. diameter fitted with spifot joint leading to the external interchanger. This would have a surface of 106 sq. ft. and would consist of a bank of concentric pipes, each 12 ft. long, arranged in two banks of eight. The inside pipe would be 2 in. in diameter and the outside 3 in.

The gases finally leave the exchanger at about 60° C. and pass to a cooler of similar type to the exchanger, but arranged so that water is passed through the outer tube. The gas then passes to the main outlet pipe common to the five bombs, which would have a diameter of about

$$\frac{5 \times 3.14}{0.786} \times = 4.5, \text{ or, say, } 5 \text{ inches,}$$

but which would be quite high and which would lead direct into the absorber for the removal of the ammonia.

The bomb itself would be of nickel steel (C. 0.2 per cent., Ni. 3.5 per cent., Cr. 1.0 per cent., and the following not exceeding Mn. 0.65 per cent., Si. 0.2 per cent., Pb. 0.035 per cent., S. 0.035 per cent.). The internal interchanger is constructed of wrought iron, the external interchanger of good quality mild steel. The bomb would have walls 3 in. thick and would be designed to stand five tons per square inch, which is greater than the pressure produced by explosion of a mixture of hydrogen and air in the correct proportions to produce maximum pressure within the bomb.

The external dimensions would be 30.62 in. dia. and the length of bomb about 7 ft. 6 in. The bomb contains eight heating elements, each 31.6 ft. long, consisting of nickel strips on an insulating frame, requiring 462 amperes at 260 volts direct current. The terminals would be water-cooled and insulated with fibre, or alternatively a porcelain insulator could be made to withstand the temperature.

The power required is that necessary to raise the gas from 20.5 per cent., i.e., from 579.5 to 600° , so that the energy is $20.5 \times 1.326 \text{ lb.} \times 1 \text{ sp. ht.} = 27.2 \text{ C.H.U. per sec.}$

$$= \frac{98,000}{10.00} \text{ C.H.U. per hour} = 9,800 \text{ C.H.U. per hour} = 31.6 \text{ K.W.H.}$$

This figure for sp. ht. is probably high, but the higher figure is taken to be on the safe side.

The heat given by the reaction is

0.051 lb. NH_3 per second \times 760 C.H.U. per sec. per lb.
 = 39.2 C.H.U. per second = 141,000 C.H.U. per hour.
 The heat required to raise the gases to exit temperature
 629.5° from 20° C. =

$$\frac{1.36 \times 1 \times 579.5}{2,780,000} = 767 \text{ C.H.U. per sec.} =$$

Of this, 141,000 C.H.U. are supplied by the reaction, and
 98,000 C.H.U. by the heater element, or a total 239,000 C.H.U.

$$\frac{2,541,000}{2,780,000} = 91.5 \text{ per cent. is assumed as the interchange efficiency, inclusive of radiation losses, etc.}$$

Even with the small bomb a total heating interchange efficiency of 76.5 per cent. has been obtained, and an efficiency of interchange of 90 per cent. ought readily to be obtained with a large bomb. For a 25-in. bomb it has been worked out that 95.4 per cent. is the probable efficiency of heat interchange. Inclusive of radiation losses for 111.8 lb. of ammonia per hour, produced in a bomb of 25 in. dia., 13.85 K.W. is the maximum and 4.45 is the efficiency consumption of energy. So that for 186 lb. per hour in a small bomb, but of rather larger catalyst space and with the external interchanger, the power consumption of about 21.9 K.W. would be the maximum requirement. This agrees with an average value for twenty 50-in. bombs, which require 1,920 K.W. and should give 3.3 times the output, so that

$$\frac{1,920}{3.3 \times 20} = 29.2 \text{ K.W.}$$

would be the corresponding power required per bomb of 25 inches. On the whole, therefore, it appears safe to assume a figure of 50 K.W. per bomb and for the whole production, corresponding to 13.2 bombs

$$13.2 \times 50 = 660 \text{ K.W.}$$

The maximum requirements, supposing 20 bombs to be in operation, would be 1,200 K.W.

The gases leaving the ammonia scrubber pass to a circulating pump. There is one scrubber and one circulating pump for each set of bombs and there should be a spare circulating pump as a standby. The differential pressure between one size bomb and the other would be about 2-3 atm.

Three-throw double-acting pumps driven electrically through gearing with a piston speed of about 180 ft. per minute have been chosen for such service. They would be lubricated with water and would require 31 b.h.p. (45 b.h.p. motor), so that a total of $3 \times 45 \times .740 = 100$ K.W. would be required for this service.

The absorber would consist of two counter-current scrubbers into which water is forced at 155 atm. The quantity of ammonia to absorb = 0.0517 lb. per second per bomb, or a total of 41 lb. per minute for the whole plant.

Now the quantity of water for a 25 per cent. ammonia solution would be

$$41 \times 3 = 123 \text{ lb.} = 12.3 \text{ gal. per minute.}$$

The water would enter counter current to the ammonia, so that only a very small percentage of ammonia is remaining in the gas, say .02 per cent.

Four pumps, each of five gal. per minute capacity, requiring a motor of about 16 b.h.p., would be required. There should be a standby pump which could be brought into circuit for any one of the groups.

After leaving the circulating pump the gas would pass through an empty cylinder, so that any water could be deposited and thence to the branch circuits feeding each bomb. But before entering the heat exchangers it would pass through one of two steel containers containing lime, in order to completely dry the gas. At 20° C. the vapour pressure of water is 17.5 mm. and the percentage pressure of 150 atm. would be

$$\frac{17.5 \times 100}{760 \times 150} = 0.01534 \text{ per cent.}$$

which in terms of water vapour would be

$$\frac{0.01534 \times 216,000}{100} = 33.2 \text{ cu. ft. at 1 atm. pressure and 20° C.}$$

$$\frac{33.2 \times 18}{385} = 2.1 \text{ lb. per hour per bomb.}$$

As 18 lb. of water are absorbed by 56 lb. of lime, 2.1 lb. would be absorbed by

$$\frac{2.1 \times 56}{18} = 6.5 \text{ lb. per hour,}$$

or at 50 per cent. efficiency, say 13 lb. per hour.

Suppose the velocity through the dryer be 5 ft. per second and let it be 5 ft. long, so that there is one second's contact, then, as the volume of gas to be dealt with per second per bomb = 0.4 cu. ft. at 150 atm. and 20° C., the net area required would be

$$\frac{0.4}{5} = 0.08 \text{ sq. ft.}$$

and the gross area about

$$\frac{0.08 \times 100}{8} = 1 \text{ sq. ft.}$$

So that each dryer should be 1.13 ft. in diameter and about 5 ft. long. It will consist of a cylinder with walls about 3 in. thick, with both ends flanged and bolted, and arranged so that the contents can be conveniently charged and discharged. A pair of these cylinders should be opposite each bomb, so that when one is being used the other one would act as a standby. Such a dryer would contain 5 cu. ft. of lime = 745 lb., so that the lime would last

$$\frac{745}{13} = 57 \text{ hours.}$$

The total lime used on the plant in this way for drying purposes would work out to be less than two tons per day for 100 tons of ammonium sulphate. If calcium chloride were used the quantity required would be considerably less, but this material is not so satisfactorily handled.

It would appear that this method of removing the water is after all much the simplest, and the cost would only be about 6d. per ton of ammonium sulphate. Drying out by refrigeration is tied to a larger capital expenditure, and at any rate for the first portion of plant a drying agent would seem to be the most satisfactory scheme to adopt.

Each group of bombs would be so arranged that they would be controlled from one situation, where would be fitted the necessary pressure gauges, flow meters, oxygen detectors, ammonia percentage meters, temperature indicators, electrical resistance. Non-return and safety valves would be placed where required in the circuit. Circulation pumps would be worked at a regular governed rate, but the control valve of each bomb would work in connection with a by-pass through which the gas would circulate when not passing through the bomb. In this way any one bomb could be thrown out of circuit without upsetting the flow through the other bombs.

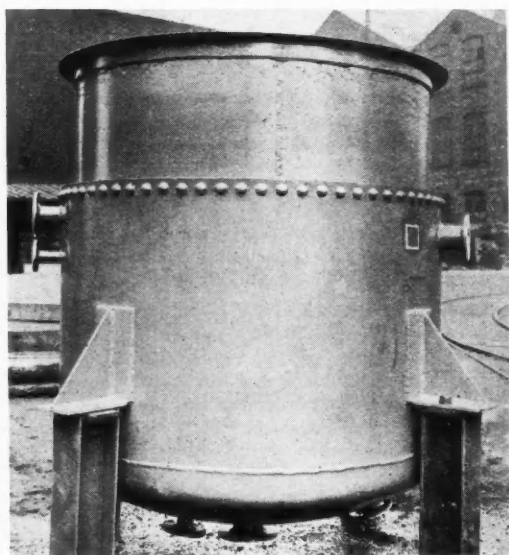
The ammonia liquor produced would pass to an overhead closed tank where the pressure would be released, and which would feed into a boiler shell of the usual type for storage of ammonia liquor, through which in turn it would flow by gravity to the ammonium sulphate plant.

(To be continued.)

PRINCIPALLY as a result of the development of the German synthetic resin industry, the production of phenol increased from 3,000 metric tons in 1925 to 8,600 metric tons during 1934. Production of nitrocellulose plastic products in the United States in the first five months of 1935 increased to 6,900,809 lb. from 5,891,711 lb. during the corresponding period of 1934.

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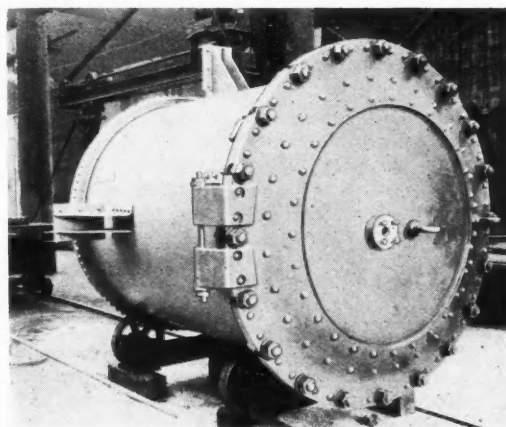
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The Coke Oven Managers' Association

New President Pleads for Extended Research Activities

THE annual meeting of the Coke Oven Managers' Association was held in London on October 24, and the annual dinner was held the same evening at the Hotel Victoria under the chairmanship of the newly-elected president, Mr. T. Westthorp, who was for some years secretary of the Association.

Mr. WESTTHORP, in his presidential address, said the importance of investigation and research could not be too frequently emphasised. Too sharp a division between fundamental and industrial research should not be made. Members would have their own views as to what might properly be undertaken by universities and other specialised organisations, but he urged that as much as possible should be done by coke oven companies themselves. They were the best judges of their own requirements and should have competent staffs and equipment to carry out technical investigations and control work. Such an arrangement might present difficulties to small companies; for them the alternative would seem to be joint research controlled by and for themselves. Information, to be of practical value, should be obtained on plant approaching full scale. This, as conducted at present, rendered progress slow and spasmodic and generally gave rise to temporary scepticism, justified or otherwise, always resulting in delay. A joint research establishment would do much to remove these difficulties.

Problems Awaiting Solution

The financial and other equally important factors involved in such a project should not be insurmountable. The technical personnel of the industry had already shown what it could do in times of national crisis. The best utilisation of our coal resources being a fundamentally permanent requirement to the well-being of this country and never more pressing than the present, a statement of the considered views of the Association should not be unwelcome to those whom it concerned. In stressing the suggestion for such an establishment the good work done by the several Coke Research Committees, the National Coal Survey, the Government research departments and other research groups was not overlooked, but their equipment could not be regarded as a satisfactory substitute for full sized oven with associated plant. This had long been recognised on the Continent and in America. The coke oven works was the best place to conduct coke oven research and enterprising companies recognised this.

There were many problems awaiting solution. Nature itself had precluded quiescence for the coal utilising industries by the way it had arranged the coal deposits as regards character and quality. The variation and general deterioration in character and chemical purity had rendered indifference to technical control impossible. To manufacture the varieties of coke now demanded and to maintain constant quality, or to improve it to meet changing requirements was a problem the magnitude of which required no emphasis, and was definitely technical.

As a result of the advances in the technique of direct hydrogenation of coal, it might in the near future become worth while to separate certain fractions of a coking seam, which at present could not be discarded, but which adversely affected the quality of the coke from particular plants. The treatment of gas for new chemical products should be fully investigated. Carbon monoxide, heavy hydrocarbons and menthane had possibilities as basic substances from which other products, *e.g.*, liquid fuels and plastics could be produced, whilst as a source of hydrogen, coke oven gas was still the cheapest. The establishment of an economically efficient method of methyl alcohol manufacture from coke by the application of

the water gas reaction and cheap catalysts was deserving of attention.

With regard to tar, perhaps the most promising variant in present uses would be found in hydrogenation when the technique of the process was sufficiently advanced to enable small units to be profitably attached to coke oven plants of medium size, say, 3,000 to 5,000 tons throughput of coal per week. The advantages of an extension of the use of coke oven gas as a fuel and propellant were of prime importance. There were still large volumes of high-grade gas available. The claims put forward for the extended use of coke oven gas had been fully established in fact. The practice was becoming general and its wisdom was established by users and authorities in their sister industry. Eminent authorities had recently stated that as a heating agent gas was more economical in use than electricity and that the future of gas lay in a wide expansion of its uses as a heating agent both for industrial and domestic purposes, and that as far as flexible heat was concerned, gas was the very last word in science. The Association played its part in urging this matter at the proper time and place, and results had substantiated its claims.

Recovery of Benzole

The production and recovery of benzole and its homologues was now a valuable part in coking practice, and was carried out efficiently on most plants, but the last word had by no means been said. The yield and quality was bound up with the design and operation of carbonising and recovery plant, the physical and chemical nature of the coal charge; also the type of absorbent and chemical system of rectification. Conclusions drawn from research or experience on other than full-scale plant should be received with caution and might be very misleading. The development and adoption of the use of inhibitors in this connection had proved advantageous on many works and had reduced the former losses of motor benzol substantially, but if the rigidity of the specification increased much further and also the complicated treatment of crudes, which were evidently necessary with some benzols, to meet it, the overall economies and advantages might become questionable.

The chemical composition and molecular structure of coal was not yet fully understood. With the varied heat treatment now possible, due to the availability of type and excellence of refractory materials in this country, it was difficult to conceive a more complex industry or one of greater possibilities. When to this was added the fact that coal was our chief national raw material, a plea for extended research was fully warranted.

In conclusion, Mr. Westthorp said the Association could now claim to be as thoroughly representative of the coking and allied industries as possible, but this condition increased its responsibilities. The council fully recognised the fact, and would welcome the fullest interest of all classes of members at the respective section meetings. It was only by doing so that the Association could maintain its position amongst the important societies of the country and discharge its duties to the industrial interests it represented.

Following the transaction of the annual business the annual dinner was held at the Hotel Victoria, Mr. T. Westthorp presiding.

Speeches at the Dinner

Sir CECIL COCHRANE proposed the toast of the Association and said the lot of the coke oven manager was no sinecure and was a very different proposition from that of twenty or thirty years ago. Ovens to-day were four feet higher and eight feet broader than they were in the days preceding the

1914-18 war; firing was not so uniform and the fact he regretted most was that the best seams of coal had been worked out. These factors all contributed to render the lot of the manager a far from happy one. Sir Cecil went on to make two points, both of which he considered were vital to the development and well-being of the industry. The first was research. They could not expect to make any further progress until a satisfactory solution to the problem of research had been found. Laboratories that were understaffed and ill-equipped, he said, represented a policy so short-sighted that he was surprised they had tolerated it so long. He suggested a common pool out of which methodical research could be directed and financed. Discoveries were of great benefit to everybody, and it was only fair that those who benefited should pay something for the benefits. The policy of the Fuel Research Board was more general and they could not expect the Board to deal with coke problems entirely. Many experiments which promised great things in the laboratory turned out utter and disappointing failures when tried out commercially on a large scale. He suggested that these disappointments might, to a great extent, be avoided if coke oven managers would place ovens at the Board's disposal. This plan would save the great expense of erecting purely experimental ovens and would greatly facilitate the carrying out of large-scale experiments.

The other great problem was that of distribution. They needed a carefully planned sales organisation. It was not sound business to cut each other's throats by fierce price-cutting when if they would only combine they could get a higher price for their products. Their chief problem in this respect was the disposal of their gas. He regretted that there was not better feeling and more co-operation between the two industries. The gas industry should be regarded as their largest customer and not treated with suspicion. If members of the Association would co-operate in the matters of research and of selling their products they would greatly assist the uphill fight that their industry was waging. Sir Cecil concluded by complimenting the new president, Mr. Westthorp, and said that both he and the Consett Iron Co. felt proud of the great honour that had been accorded him.

Mr. Westthorp responded to the toast, and enlarged upon the problem of research which Sir Cecil Cochrane had advocated.

Third World Power Conference

To be Held in the United States

THE Third World Power Conference will be held in Washington, United States, from September 7 to 12, 1936. Invitations have been issued by the State Department—United States Foreign Office—on behalf of President Roosevelt, and the International Executive Council of the World Power Conference had already decided unanimously to accept such formal invitations when issued. This will be the third plenary meeting of the World Power Conference, the first plenary meeting having taken place at Wembley in 1924, and the second at Berlin in 1930. There have in addition been a number of sectional meetings. The Chemical Engineering Congress of the World Power Conference to be held in London next June, ranks as one of these series of sectional meetings. The general subject to be discussed at the Third World Power Conference is the national power economy. Among the aspects to be treated are the following: Physical and statistical bases; technical, economic and social trends; organisation of fuel industries and of gas and electric utilities; public regulations; national and regional planning; conservation of fuel and water resources; rationalisation of distribution; national power and fuel policies. The second congress of the International Commission on Large Dams of the World Power Conference will be held in Washington at the same time. Further particulars will be issued in due course. British participation will be organised by the British National Committee, 36 Kingsway, London, W.C.2.

The Advertising Association

Sir Ernest Benn to be President

SIR ERNEST BENN, chairman of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, has accepted the invitation of the Council of the Advertising Association to become president for the ensuing year. He was formally elected on October 25. The Advertising Association states:

"The honour the Association is conferring upon Sir Ernest is one which in the opinion of the Council he has richly merited.

"No Convention speeches have been more successful than those made by Sir Ernest Benn. At Birmingham in 1928, at Hastings in 1930, and in Leicester last year, Sir Ernest aroused enthusiasm with his witty but logical addresses, and in 1929, when the Association took 260 delegates to the International Convention at Berlin, Sir Ernest at a moment's notice, following the indisposition of the late Lord Riddell, stepped into the breach and made a series of speeches which, by general consent, were the most brilliant of the Conferences.

"In addition to his large publishing interests Sir Ernest is now the chairman of the United Kingdom Provident Institution—one of the greatest life offices.

"Sir Ernest is the author of nine or ten works on economics and is the proprietor of possibly the largest group of trade papers in Europe.

"He has occupied the offices of president of the National Advertising Benevolent Society, the Aldwych Club, the Readers' Pensions Corporation, the British Export Society, and the Royal Commercial Travellers' Schools."



Sir Ernest Benn

American Chemical Society Monographs

An English Agent Appointed

CHAPMAN AND HALL, LTD., have been appointed sole British Empire agents for the publications of the Reinhold Publishing Corporation, who are successors to the Chemical Catalog Company, Inc. Readers of scientific and technical books will already be aware of the importance of the volumes issued in this list. In addition to the scientific and technical books which have had so wide an appreciation, the Reinhold Publishing Corporation control the issue of volumes appearing under the auspices of the American Chemical Society. This scheme of publication was undertaken by arrangement with the Interallied Conference of Pure and Applied Chemistry, which met in London and Brussels in July, 1919. The American Chemical Society and the National Research Council mutually agreed to care for certain fields of chemical development. The Council appointed editors who have endeavoured to select topics which are of current interest, and authors who are recognised as authorities in their respective fields. The particularly valuable monographs which have resulted from their united efforts have provided chemists throughout the world with an especially useful means of reference. The importance of the enterprise has been appraised by members of the chemical and allied industries, and a London firm is honoured to have the distribution of these works throughout the British Empire. A complete catalogue (150 titles) can be obtained on request from Chapman and Hall, Ltd., 11 Henrietta Street, London, W.C.2.

S. A. AZOGENO, Genoa, recently received authorisation to increase its nitrogen-fixation plant and to add units for the production of ammonium nitrate at Vado Ligure, and to build a unit for concentrated nitric acid at its Bussi plant.

Notes and Reports from the Societies

Society of Chemical Industry

Liverpool Section: Alkali Act and the Chemical Industry

IN his lecture on "The Alkali Act and its Relation to the Chemical Industry," delivered to the Liverpool Section of the Society of Chemical Industry on October 20, Mr. W. A. Damon related how the first Alkali Act was placed on the Statute Book 72 years ago as a result of the findings of a Commission set up to inquire into the nuisance caused by acid fumes from the Leblanc process for making alkali. The process had been introduced into England in 1823 by James Muspratt, the grandfather of the late Sir Max Muspratt, who set up the first commercially successful plant of this kind in Vauxhall Road, Liverpool. The industry rapidly extended, but owing to the damage caused by the hydrochloric acid which was allowed to escape from it, the manufacturers were continually harassed by legal proceedings and claims for damages. The Alkali Act of 1863 was introduced by Lord Derby. The Act did not aim at suppression of the alkali industry, the value and importance of which was appreciated, but initiated procedure by which the emission of acid gas was limited to the lowest possible amount. Inspectors were appointed by the central authority to administer the provisions of the Act.

Since 1863 the Alkali Act has been greatly extended. At the present time its provisions regulate the emission of noxious or offensive gases from 25 different chemical processes. The main object of the Act is to protect the general public from injury or damage as the result of noxious gaseous emissions. Every endeavour is made to enforce the regulations without interference with the natural development of the industry and, to this end, inspectors are appointed who have themselves had practical chemical works experience and whose duty it is, especially when trouble arises with new processes and developments, to advise and assist, securing the best possible conditions from the points of view both of the public and of the industry itself.

Methods of treating noxious gases may be classified into several categories. In considering the best method to adopt, special consideration must be given to the situation of the works and other local circumstances. The treatment of gases containing sulphur oxides, hydrogen sulphide, hydrofluoric acid and hydrochloric acid was discussed by Mr. Damon, and special attention directed to the removal of sulphur dioxide and dust from chimney gases from large fuel-burning installations and cement works. Deodorisation of offensive gases is dealt with and the difficulties connected with escapes of gas and smoke from coke ovens and from burning colliery refuse heaps is also discussed. The lecture concluded with an appeal for co-operation in the task of securing an atmosphere more free from smoke and other objectionable impurities.

Food Group Hears Five Papers

THE opening meeting for the new session of the Food Group of the Society of Chemical Industry took place at the London School of Hygiene and Tropical Medicine, on October 16, when five papers were read.

The first paper, by Mr. A. L. L. Matthison, dealt with "The Use and Purpose of Lacquer for Food Containers and Closures." This was an interesting survey of the important subject of lacquer, the processes involved in its application and the various types of food container.

"Present-day Milk Problems" was the subject of a paper by Mr. Ben Davies, in which it was urged that consideration be given to the possibility of permitting systems other than the exclusive officially authorised method of pasteurisation. He said methods of heating milk to a temperature of 160° F. for 15 seconds give complete protection against tubercle, but there appears to be a consensus of scientific opinion that a

bactericidal efficiency which eliminates tubercle affords protection against other pathogenic organisms with which we may have to contend in milk. With modern resources for controlling temperatures to fractional degrees, and preventing the discharge of under-heated milk, there would seem to be no reason for longer delaying the adoption and licensing of alternative systems to the holding method which is not free from difficulties and objections. The absence of any possibility of oxidation effects on vitamins, the elimination of foam, the avoidance of thermophilic bacteria in the plant and in the pasteurised milk, the immense simplification of the equipment and of its cleansing and sterilisation are advantages from which the industry is debarred pending some action by the Ministry of Health.

Composition of Meat Extracts

Dr. H. E. Cox read a short paper entitled "Notes on the Composition of Meat Extracts and Meat Cubes." He pointed out that the composition of meat extracts, as at present marketed, showed evidence of changes which had taken place during recent years. There had been a diminution in the proportions of creatine and creatinine, which were the most important meat bases present. Years ago figures for creatine and creatinine would average 10 per cent., whereas they now average about 7 or 8 per cent. There had also been a diminution in the proportion of meat fibrin and some increase in albumoses and peptones in lower grade extracts.

Purification of Drinking Water

Dealing with "The Purification of Water for Drinking," Mr. A. H. Waddington explained how the increasing demand for pure water, coupled with a decreasing number of sources of unpolluted water had led to a very rapid advance in the methods of water purification. After giving some account of the history of this development, he gave an interesting description of modern purification practice and dealt with the processes involved in the treatment of water in a variety of situations. In references to sterilisation he said ozonisation of the filtered water not only destroyed all bacterial life, but due to its breakdown into oxygen it aerated the water, yielding a bright sparkling product of improved colour and low oxygen absorbed value. For drinking water supplies ozone had an advantage that overdosage did no harm as it could not impart either taste or odour to the treated water.

Absorption Spectra of Honey

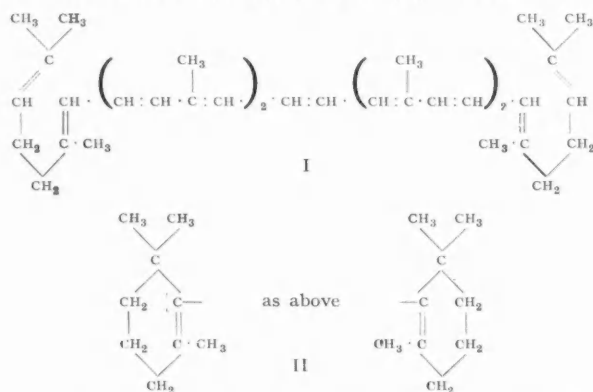
The final paper of the evening, read by Mr. P. Bilham, was a joint contribution with Dr. Lampitt under the title "Notes of the Absorption Spectra of Honey." Mr. Bilham explained that the absorption spectrum of honey had been already studied by Schon and Abilgaard, who proved that the addition of invert sugar prepared by acid hydrolysis could be detected by the appearance of an absorption band with a head at 2,825 Å due to hydroxy methyl furfural. This substance was formed on inverting sucrose with acid or heating fructose with acid; it followed, therefore, that it might be formed when genuine honey was heated during factory operations and that such honey when tested might be suspected of adulteration. The work reported, although incomplete, demonstrated that while such honey would give a positive result with the Fiehe test for hydroxy-methyl furfural it did not show the absorption band. On the other hand, as little as 2 per cent. of added invert sugar, prepared by acid hydrolysis, in genuine honey could be detected. Mr. Bilham suggested that the Fiehe test was too delicate and that only strongly positive results should be taken as evidence of adulteration. The absorption spectrum appeared to be a better criterion, but needed more study before adoption as a criterion of purity. Neither the Fiehe test of the absorption spectrum could detect invert sugar prepared by enzyme action.

Chemical Society

Leeds : Fat Soluble Pigments of Nature

IN a paper read before the Chemical Society at Leeds on October 14, Professor I. M. Heilbron pointed out that the first investigation of importance on the group of pigments known as the carotenoids or lipochromes was due to Willstätter and his collaborators, who effected the isolation of the principal pigments and established their empirical formulae. Willstätter showed that carotene, from carrots and green leaves, possessed the formula $C_{40}H_{56}$. He also showed that the red tomato pigment, lycopene, was isomeric but not identical with carotene and recognised that in addition to chlorophyll and carotene, green leaves contained an oxygenated carotenoid pigment—xanthophyll $C_{40}H_{56}O_2$.

Our present knowledge of the constitution of the lipochrome pigments is largely due to the investigations of Professors Karrer, Kuhn and Zechmeister. On the physical side, these workers employed chromatographic methods together with spectrographic and polarimetric analysis for the separation and identification of individual pigments, while on the chemical side quantitative catalytic hydrogenation and graduated quantitative oxidation with chromic acid and permanganate have been employed. By these means it has been possible to ascribe formulae (I) to lycopene and (II) to carotene.



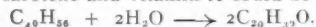
It was later observed that carotene was complex, consisting of a mixture of α - and β -forms. In addition a third isomer, γ -carotene, is met with in nature, although of rare occurrence. The xanthophyll of leaves is likewise complex, the main constituent being identical with lutein, the main pigment of the egg yolk, accompanied by zeaxanthin, which is most readily isolated from maize.

Professor Heilbron next proceeded to describe other plant pigments such as kryptoxanthin, $C_{40}H_{56}O$, isolated from the berries of the *Physalis* series, and the isomeric rubixanthin from rose hips; flavoxanthin, $C_{40}H_{56}O_3$, from buttercups, violaxanthin, $C_{40}H_{56}O_4$, from pansy blooms, and taraxanthin, $C_{40}H_{56}O_4$, from dandelions, all of which are alcohols. In addition he pointed out that ketonic members also occurred in nature, examples being rhodoxanthin, $C_{40}H_{56}O_2$, from the red yew berries and capsorubin, $C_{40}H_{56}O_4$, and capsanthin, $C_{40}H_{56}O_3$, the pigments of paprika. In the lower forms of plant life fucoxanthin, $C_{40}H_{56}O_6$, the pigment of the brown alga has recently been examined in detail in the Manchester laboratories and the important biological fact established that on the death of the plants fucoxanthin passes into zeaxanthin, the first such biological change to be recorded.

The carotenoids are by no means confined to the plant kingdom but are distributed throughout the animal world. Among the vertebrates the carotenoids are absorbed from the food and, as in plants, consist mainly of lutein and carotene. In the invertebrates several new types of carotenoids have been found. Among the crustacea the main pigment appears to be astacene, a di-enol tetraketo-carotene, $C_{40}H_{48}O_4$, which exists either alone or as protein complexes, thus presenting a wide range of colours. Among other invertebrates, sea ane-

mones have been found to contain highly oxygenated lipochromes; in Manchester an acidic pigment violerythrin, $C_{40}H_{44}O_6$, characterised by its deep purple-blue colour, has been isolated from *Actinia Equina*, which from *Anemonia sulcata* a yellow non-acidic pigment, sulcataxanthin, $C_{40}H_{48}O_8$, has been obtained.

Professor Heilbron next considered the physiological importance of the carotenoids and pointed out that the relationship between carotene and vitamin A could be summarised as



He concluded his lecture with an account of recent investigations on the carotene and vitamin A contents of summer and winter butters and pointed out how, by employing either artificially dried grass or A.I.V. silage, it was possible to maintain the carotene and vitamin A contents of winter milk at the high summer level. The importance of these findings in relation to nutrition was emphasised.

Institute of Chemistry

Newcastle Section Visits Billingham

THE North-East Coast Section of the Institute of Chemistry visited the works of Imperial Chemical Industries, Ltd., at Billingham on the afternoon of October 23 by courtesy of the directors. In the evening a dinner was held at Stockton, some fifty people being present, followed by a meeting with the Norton Hall Scientific Society, when the Registrar of the Institute (Mr. R. B. Pilcher) gave an address entitled "From Boyle to Priestley." Mr. Pilcher's interesting research on the lives of chemists of this period was superbly illustrated by over sixty slides taken from his unique private collection of old prints.

Society of Dyers and Colourists

Scottish Section : Properties of Woven and Knitted Fabrics

IN a lecture entitled "A Comparison of Some Properties of Woven and Knitted Fabrics," delivered to the Scottish Section of the Society of Dyers and Colourists on October 25, Mr. A. J. Hall, B.Sc., F.I.C., F.T.I., discussed those properties which determine the usefulness of fabrics and the methods of dyeing and finishing by which they are made attractive. He said a very coarse woven crepe fabric is perhaps the nearest approach which the woven fabric can make towards the knitted fabric in respect of stretchability, but in this case the crepe fabric is unstable and tends to shrink in length and width whereas the knitted fabric retains its superficial area. Methods for dyeing and finishing knitted fabrics are governed by the fact that such fabric tends to retain its normal superficial area so that when it is stretched in one direction it contracts in another. It is therefore obvious that no process is suitable for knitted fabric in which it is run backwards and forwards from one roller to another, especially if the fabric be flat and not tubular knitted. The distortion caused by such prolonged length stretching would become unmanageable. Thus bleaching or dyeing of knitted fabric on a jigger (the most popular machine for woven fabric) is impossible. Such treatment must be carried out in a winch machine or in package form. Unlike woven fabric, the selvages of a knitted fabric are its weakest point and they always tend to curl inwards. This constitutes a difficulty in dyeing which can only be obviated by stitching the edges together to make the fabric tubular. For much the same reasons, knitted fabrics, after dyeing, are never dried on the drying cylinders so commonly used for woven fabrics. The most satisfactory drying method is that of blowing hot air through the fabric whilst in tubular form.

Hitherto knitted fabrics have been invariably finished by calendering or hot pressing, the desired width being obtained by means of an internal stretcher, but within the last two

years special stenters have been devised so stenter finishing can be carried out. The chief difficulty which has delayed the adoption of stenter finishing for knitted fabric is that feeding the fabric into the pin clips at a sufficiently accelerated rate to allow the fabric to be stretched in width whilst being carried forward by the clips. With woven fabric no such difficulty is experienced and for this reason stenters are the most important finishing machines for this type of fabric. In finishing knitted fabric it is undesirable to stretch it to obtain the utmost superficial area since under these conditions the fabric loses the extensibility which constitutes its most important property. In the case of glove fabric it is required that this should have no extensibility in length, but that it should stretch readily in width so that it can form a good fit over fingers and hand. Difficulties in dyeing and finishing are just about as numerous for knitted as for woven fabrics. On the whole, woven fabrics can be wet processed at a much more rapid rate than knitted fabrics.

Pharmaceutical Society

Harrison Memorial Lecture

THE first evening meeting of the 1935-36 series will be held in the Pharmaceutical Society's House, on Tuesday, November 12, when the Harrison Memorial Medal will be presented to Professor Arthur Smithells, F.R.S., director of the Salters' Institute of Industrial Chemistry. Professor Smithells will deliver the Harrison Memorial Lecture, taking "The Teaching of Chemistry" as his subject. Professor Smithells was chief chemical adviser (anti-gas training) G.H.Q. Home Forces, 1916-1919, and was closely associated with the late Colonel E. F. Harrison, director of chemical warfare, in anti-gas work.

Society of Glass Technology

Presidential Address

THE first meeting of the Society of Glass Technology for the session 1935-36 was held in Sheffield, on October 16, when the president, Mr. Bernard P. Dudding, A.R.C.Sc., F.Inst.P., delivered his presidential address, taking as his title "Meditations, Speculations, Aspirations."

Dealing with fundamental research, Mr. Dudding said at the present moment there appear to be no methods for direct attack on the glass problem as useful as the methods of microscopy applied to metallurgy. Therefore less direct methods have to be relied on, the results obtained being studied with a view to finding some measure of correlation between them. The only methods available for a direct attack on the constitution of glass are those which utilise a beam of X-rays or a beam of electrons. The attempt to get indirect evidence as to the constitution of glass has centred in the change in the various properties of glass which is associated with change in temperature and/or composition. One of the features of more recent work is the underlying suggestion that the thermal history of glass has a very definite effect on the properties studied. There have been several noteworthy attempts to apply to results of experiments on glass such generalised relationships as are derived from the studies of other materials. Even more indirect methods of attacking this problem of the constitution of glass have been pressed into service. These methods involve the comparison of the behaviour of glass with other states of matter such as supercooled liquids and metals, under specified experimental conditions.

Many people feel that the solution of what are usually called practical problems should be given precedence over the more fundamental research, but without minimising the importance of the former class there is much that can be urged to support the need for the emphasis given to the purely scientific outlook. First, by tackling only the tech-

nological issues which arise in the glassworks in the light of present knowledge we are in the position of one who tries to live on his capital. Secondly, we cannot entirely ignore the fact that in some cases commercial rivalry exists between those we are paid individually to serve and that therefore the detailed discussions of works difficulties is bound to impose limitations which are less likely to arise when discussing the application of established scientific principles to the better understanding of the materials and processes used in the industry. Thirdly, if by our corporate action we can provide improved scientific tools and methods which have general application in the industry we are more likely to be encouraged to discuss problems which impinge on the competitive field.

The Chemical Club

Mr. J. F. Ronca Elected President

THE seventeenth annual meeting of the Chemical Club was held at the Club, 2 Whitehall Court, on Monday evening, under the chairmanship of Mr. F. A. Greene, who, at the outset, made feeling reference to the loss which the Club had sustained by the death of Dr. W. R. Hodgkinson, a past president, and Mr. W. H. Coleman, a past chairman.

Mr. J. DAVIDSON PRATT, hon. secretary, in presenting the annual report, stated that last year the executive committee prepared a booklet describing the Club and its amenities and afterwards embarked upon a membership campaign. A moderate response was secured, mainly through the personal efforts of members of the committee, but an appeal to members at the last annual meeting to assist in the campaign had had only a negligible effect. The membership a year ago was 516, but this included a number of unpaid subscriptions. During the year the Club lost 48 members by deaths and resignations, while the number of new members, including reinstatements, was only 36. There was thus a net loss of 12, leaving a net total membership of 504. The accounts showed that the executive committee had exercised economy and had effected a reduction of £28 in the expenditure.

Appreciation was expressed in the report to the retiring president, Lord Leverhulme, and the retiring chairman of the committee, Mr. F. A. Greene. The latter had given many years of service to the Club, first as hon. treasurer and then as chairman, and during the last few difficult years had constantly striven to put the Club on a satisfactory footing. Three members of the executive committee were due to retire, namely, J. Blair, R. L. Collett and G. Bolton Smith. The last two were eligible for re-election. The committee expressed thanks to Mr. Blair and Mr. Collett for their many years' service to the Club.

Mr. J. F. Ronca was unanimously elected president for the ensuing year, in succession to Lord Leverhulme, and other elections were: Chairman of executive committee, Mr. H. J. Pooley; hon. treasurer, Mr. T. H. Farebrother; hon. secretary, Mr. J. Davidson Pratt; members of executive committee, Mr. R. L. Collett, Dr. J. Vargas Eyre and Mr. G. Bolton Smith. Dr. E. H. Tripp was elected an honorary member of the Club and Messrs. Hughes and Allen were reappointed auditors.

At the close of the business, Mr. Greene installed his successor in the chair, and Mr. Pooley, in his response, appealed for the support of every member of the Club during his period of office.

Activity at South African Ochre Mines

THE ochre paint mines at Riversdale, Cape Province, have been receiving larger orders from overseas, and this has resulted in activity unequalled in the past. These are the only mines of their kind in South Africa. Three grades of pigment are obtained, of which the highest, known as super, is used for the manufacture of certain types of paint.

Continental Chemical Notes

Hungary

THE NIGRO CARBON CONCERN has commenced the manufacture of carbon black in a daily output of 700 kilograms.

Spain

FOLLOWING RECENT LEGISLATION aiming at encouraging domestic production of liquid fuels, plans are being drawn up for the erection of 10 hydrogenation plants utilising brown coal as the raw material.

Czecho-Slovakia

THE OLMECZ GASWORKS intends to commence benzole extraction in the near future.

GOVERNMENT MEASURES TO LIMIT PRODUCTION of starch products include prohibition of new company formations intending to engage in starch syrup and starch manufacture and refusal of production permits to those undertakings who have not utilised to the full their manufacturing quotas in the past year. These restrictions do not apply to the production of starch and dextrin for direct utilisation by such producers as textile factories.

France

A CONCESSION HAS BEEN GRANTED to a firm in the Ain for distillation of sulphur-containing shale oils. The high sulphur content of these oils is reported to render them suitable for insecticide manufacture.

A PROGRESS FOR IMPROVING THE DRESSING PROPERTIES of tars and other hydrocarbons patented by the Paris Gas Company depends upon treatment with a powder containing a large proportion of finely-divided sulphur. It is believed that the sulphur acts upon the unsaturated hydrocarbons of tar by fixation of the free valencies and produces an effect comparable to that of vulcanisation upon rubber. The treatment can be effected in the cold and does not lead to evolution of sulphuretted hydrogen or sulphur dioxide (French Patent 780,472).

Holland

AN IMPRECNATING MATERIAL capable of withstanding the action of mustard gas is reported to have been developed after researches at the University of Amsterdam. Military overcoats are being impregnated with the material.

Germany

THE TOTAL GERMAN OUTPUT OF PETROLEUM during the first nine months of 1935 is declared at 324,000 tons, as compared with a total of 313,000 tons for the whole of 1934.

STATISTICS OF THE GERMAN RAYON INDUSTRY reveal considerable expansion in the copper and acetate branches in 1934, the respective increases in production over 1933 being 38 and 58 per cent. The increase in production is reported to have been even more marked in the viscose branch, states the "Chemische Industrie" (although the actual percentage increase is not quoted).

Italy

AN INTERESTING SERIES OF METALLIC DERIVATIVES of pyrrole and indole have been recently investigated by Saccardi and Giuliani ("Chemica," 1935, Nos. 6-7, p. 219-221). Mercury indole is a white amorphous substance turning yellow in contact with sodium carbonate and acquiring a red coating on exposure to the air; it contains 46.07 per cent. mercury. Tellurium pyrrole, a deep black amorphous product insoluble in hydrochloric acid and soda, contains 32 per cent. tellurium. Selenium pyrrole, also deep black in colour but turning reddish violet on warming with a solution of sodium carbonate, contains 40.5 per cent. selenium. In the authors' experience, the black complexes formed by reaction of palladium chloride with pyrrole are superior in catalytic activity to platinum black. Acetylene combines with water in presence of these complexes with formation of acetaldehyde. All the organo-metallic compounds described above are excellently adapted for carrying out numerous syntheses and fissions, their catalytic activity being much higher than that of metals even in the spongy form.

Far Eastern Chemical Notes

China

MEASURES FOR DEVELOPING THE PETROLEUM RESOURCES in the province of Schensi are estimated to involve an outlay of about 10 million dollars, of which 7 millions will be provided by the Government and the remainder by Chinese industrialists. The enterprise will be administered by a semi-official company.

Manchuria

PROGRESS IN EXPLOITING THE MAGNESITE DEPOSIT in the southern portion of the former province of Mukden, near the Tashihchiao Railway Station, is reported in the "Chemische Industrie," October 19. The Japanese-Manchurian Magnesium Co., formed in 1934, owns several mines. In the first five months of 1934, 244,000 tons of magnesite were shipped from the mines of the company to its two Japanese factories at Ube and Naetsu. American light metal interests are understood to be negotiating for magnesite supplies from Manchuria.

Japan

THE ORIENTAL NITROGEN CO. (Toyo Chisso K.K.), in which seven leading firms are interested, has now commenced the manufacture of benzole from calcium carbide.

SODIUM PERBORATE in monthly output of 20 tons is now being produced at the Yamakita factory of Edogawa Kogyosho.

MANUFACTURE OF SACCHARIN has been commenced by Nippon Seuryo Seizo K.K., and TORYU KAGAKU Kogyo.

SOYA BEANS ARE THE RAW MATERIAL for gelatine manufacture now being undertaken by Nippon Shokuryo Kogyo K.K., which is increasing its capital by 5.1 million yen.

GUAIACOL MANUFACTURE is being commenced by Nippon Soda K.K. Hitherto this substance has only been manufactured in Japan by Yamakawa Seiyaku K.K., and considerable quantities are still imported, the latest statistics revealing an annual importation of about 20,000 kin valued at 200,000 yen.

Tunisian Phosphate Exports

TUNISIAN phosphate exports during the first five months of 1935 totalled 557,000 metric tons, as compared with 780,000 tons for the corresponding period of 1934. Production for the period under review fell to 678,500 tons from 760,000 tons. All leading markets, with the exception of the United Kingdom, purchased less Tunisian phosphate in early 1935 than for the corresponding period of 1934.

Personal Notes

MR. J. P. COSTELLO, of Galway, has been elected president of the Pharmaceutical Society of Ireland.

MR. WILLIAM REAVELL has been re-elected president of the British Engineers' Association.

PROFESSOR SUGDEN, of Birkbeck College, gave a lecture at Leeds University on October 29, in association with the Leeds Philosophical and Literary Society, on "Artificial Radioactivity."



Mr. J. F. Ronca

MR. J. F. RONCA, Director of Gas Administration under the Gas Undertakings Acts, was elected president of the Chemical Club on Monday evening. He is one of the most popular members of the Club.

MR. TOM ROSTRON KAY, one of the partners in the firm of James Kay and Sons, Ltd., manufacturers of soaps and oils, Ramsbottom, near Bury, Lancashire, died on October 17, aged 73 years.

MR. ALBERT FRENCH, vice-president of the International Agricultural Corporation, died at New Jersey on October 3. He started his career with the Standard Oil Co., and later was concerned with the Liebig Manufacturing Co.

DR. W. H. MILLS, Sc.D., F.R.S., the RT. HON. LORD RIVERDALE, PROFESSOR A. ROBERTSON, D.Sc., and MR. H. B. SHACKLETON have been appointed to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research. Dr. E. J. Butler, D.Sc., M.B., F.R.S., Sir Kenneth Lee, LL.D., and Professor N. V. Sidgwick, Sc.D., F.R.S., have retired from the Council on the completion of their terms of office.

DR. EDWARD R. WEIDLEIN will be presented with the Chemical Industry Medal of the Society of Chemical Industry at a meeting of the Society on November 8, held jointly with the American Chemical Society. Dr. Weidlein is head of the Mellon Institute of Industrial Research, in Pittsburgh, and the award has been made in recognition of the valuable applications of chemical research to industry that have been carried out under his direction.

MR. FERGUSSON A. ESCOMBE, whose researches on photosynthesis and carbon dioxide assimilation, germination of seeds, and other subjects relating to the laws of biochemistry and biophysics, in conjunction with the late Dr. Horace T. Brown, F.R.S., are well known to botanists, died at Winchester on October 12. He was buried on October 17 at East Meon, Hants., where he had retired, owing to ill health and other circumstances, after relinquishing active participation in botanical research at a comparatively early age. He was only 63, and was suddenly seized with heart failure, from which he died after ten minutes' illness. By his loss botanical science has lost one of its most patient and careful investigators, and the greatest sympathy will be felt for his relatives. He was the elder son of William and Eliza Escombe, of Bishopstoke, Hants., and died unmarried. After working at the Todrell Laboratory, Kew, with Brown, on physiological botany, when his friend, the late Dr. Dukinfield H. Scott, F.R.S., was honorary keeper, he acted as botanist in the scientific research laboratory of Guinness and Co., at Dublin, where his collaborator, Dr. Horace Brown, was director and for a year was lecturer in botany at Wye Agricultural College.

MR. JOSEPH A. JOHNSON, president of the American Institute of Electrical Engineers in 1934, died on October 5.

COLONEL H. H. ROGERS, whose will was administered to probate on October 29, was heir to one of the Standard Oil fortunes. It disposes of a fortune estimated at £5,200,000.

DR. G. SHEPPARD, Ph.D., F.G.S., the new president of the Hull Geological Society, presided at the first meeting of the new session, which was held on October 25.

MR. H. D. BUXTON, M.A., B.Sc., Fellow of Exeter College, Oxford, has been appointed Reader in Physical Anthropology at the University for seven years.

MR. HUGH TANNER, assistant at New Cumnock Gasworks, has been appointed manager at Kirkconnel Gasworks, Ayrshire, in succession to Mr. Stevenson, who has accepted a similar post at Moffat.

MR. R. H. ROBERTS, a student at Liverpool University, was presented with the Leverhulme Prize for 1935 by Professor C. O. Bannister on October 25, at a meeting of the Liverpool Section of the Society of Chemical Industry.

CAPTAIN CROOKSHANK, Secretary for Mines, stated in reply to a question from Lord Hartington in the House of Commons on October 24, that the first licences under the Petroleum (Production) Act would, he anticipated, be issued in the next week or two, and that until that was done no drilling could be undertaken. No licence had yet been issued.

MR. G. S. JENKINS, chief chemist of the Fife Coal Co., gave an address at the Royal Technical College, Glasgow, on October 23, when he discussed the preparation of coal for the market. He said that colliery companies were yielding to the call of consumers for better prepared coal by installing modern surface equipment, particularly coal-cleaning plant.

LORD MELCHETT, a director of Imperial Chemical Industries, Ltd., speaking at the annual dinner of the Institute of Labour Management, on October 25, said that he was a strong believer in profit-sharing as the only basic method whereby equilibrium between employer and workman could be preserved.

LORD LEVERHULME was the principal guest at the forty-eighth anniversary festival dinner of the London Commercial Travellers' Benevolent Society, held at the Hotel Victoria, London, on October 18. Responding to the toast of "Continued Success to the Society," he said that the commercial traveller was the link between the house which he represented and the customer, and when anything went wrong between them he became the shock-absorber. He believed that no firm could afford to ignore the value of advertising, but personal salesmanship smoothed the way to customers, and without it business suffered in consequence.

German Supplies of Ethylene Gas Use for Treating Fruit and Vegetables

THE I. G. Farbenindustrie introduced ethylene gas upon the German market about three years ago as a material for hastening the ripening of fruits and vegetables. The product has not achieved any pronounced market success; sales reported amount to only a few hundred kilograms per quarter. The gas is marketed in steel cylinders under pressure, a 40-litre container holding around 11 kilograms of gas. The manufacturers' current price to wholesalers is 4 marks per kilogram, but substantial price reductions are forecast for the future. The domestic market thus far has accounted for nearly all the sales; the relatively small quantities exported go chiefly to the Netherlands and Italy. The gas has been found most suitable in Germany for ripening tomatoes, bananas and oranges.

Forthcoming Events

LONDON.

- Nov. 3.**—Society of Dyers and Colourists (London Section). "Dye-stuffs in Photography." J. D. Kendall. London.
- Nov. 4.**—Institution of the Rubber Industry (London Section). "Inflammability and Fire-Proofing of Rubber." T. R. Dawson. 7.30 p.m. 12 St. James's Square, London, S.W.1.
- Nov. 4.**—Society of Chemical Industry. Joint meeting of the London Section and the Food Group. "Chemical Elixirs of Life." Professor I. M. Heilbron. 8 p.m. Burlington House, Piccadilly, London.
- Nov. 6.**—Society of Public Analysts. 8 p.m. Burlington House, Piccadilly, London.
- Nov. 7.**—Institute of Metals (London Section). "The Ultimate Strength of Metals." E. N. da C. Andrade. 8 p.m. Royal School of Mines, South Kensington, S.W.7.
- Nov. 7.**—The Chemical Society. Ordinary scientific meeting. 8 p.m. Burlington House, London.
- Nov. 7.**—Oil and Colour Chemists' Association. "Some Aspects of the Solid-Liquid Interface." W. Clayton. 7.30 p.m. 30 Russell Square, London.
- Nov. 8.**—British Association of Chemists (London Section). Dance Party. Holborn Restaurant, London.

BELFAST.

- Nov. 6.**—Institute of Chemistry (Belfast Section). "Modern Fertilisers and their Use in Practice." R. G. Baskett. 7.30 p.m. Physics Lecture Theatre of the Royal Belfast Academical Institution, Belfast.

BIRMINGHAM.

- Nov. 5.**—Electrodepositors Technical Society. Exhibition of lantern slides appertaining to electrochemistry, by L. Wright. 7.30 p.m. James Watt Memorial Institute, Gt. Charles Street, Birmingham.
- Nov. 7.**—Institute of Metals (Birmingham Section). Open discussion. "The Hot Rolling of Sheets." 7 p.m. James Watt Memorial Institute, Birmingham.
- Nov. 7.**—Birmingham Paint, Varnish and Lacquer Club. "Wood Oil as a Raw Material for Varnishes and Synthetic Resins." E. Fonrobert. Dinner. 6.30 p.m. Grand Hotel, Birmingham.
- Nov. 7.**—Society of Chemical Industry (Birmingham and Midland Section). "Metals in the Chemical Industry." Professor C. H. Desch. 7.30 p.m. University Building, Edmund Street, Birmingham.

BRISTOL.

- Nov. 4.**—Institute of Chemistry. "Scientific Problems of Milk Pasteurisation." W. G. Savage. 5.30 p.m. University Chemical Department (Woodland Road), Bristol.
- Nov. 7.**—Society of Chemical Industry (Bristol Section). "Viscosity

of Tars." Dr. J. G. Mitchell. 7.30 p.m. University, Woodland Road, Bristol.

CARDIFF.

- Nov. 8.**—Society of Chemical Industry (South Wales Section). "Plasticity and the Coal Industry." Dr. W. Idris Jones. 7.30 p.m. Technical College, Cardiff.

GLASGOW.

- Nov. 6.**—Alchemists' Club. Presidential Address by J. G. Auld. 7.30 p.m. University, Glasgow.
- Nov. 8.**—Andersonian Chemical Society. "Wanted—An Intelligent Youth." S. H. Tucker. 3 p.m. Royal Technical College, Glasgow.
- Nov. 8.**—Oil and Colour Chemists' Association. "Colour Testing and Recording." Norman Bland. 7.30 p.m. Glasgow.

LEEDS.

- Nov. 6.**—Society of Chemical Industry (Yorkshire Section). "Metals in the Chemical Industry." Professor C. H. Desch. 7.15 p.m. University, Leeds.

MANCHESTER.

- Nov. 7.**—Institute of Vitreous Enamellers (Northern Section). "Notes on Furnaces for the Vitreous Enamelling Industry." Th. Teisen. 7.30 p.m. Y.M.C.A., Peter Street, Manchester.
- Nov. 8.**—Oil and Colour Chemists' Association (Manchester Section). "The Future of Natural Resins." T. Hedley Barry. Reynolds Hall, College of Technology, Manchester.

NEWCASTLE-ON-TYNE.

- Nov. 2.**—North of England Institute of Mining and Mechanical Engineers. 2.30 p.m. Newcastle-on-Tyne.
- Nov. 8.**—Institute of Chemistry (Newcastle-on-Tyne and North-East Coast Section). Joint meeting with the Bedson Club. 31st Bedson Lecture. "Carcinogenetic Hydrocarbons and their Physiological Effects." Dr. J. W. Cook. Newcastle-on-Tyne.

SHEFFIELD.

- Nov. 8.**—Institute of Metals (Sheffield Local Section). "Rolled Gold and Its Industrial Applications." E. A. Smith. 7.30 p.m. University, St. George's Square, Sheffield.

SWANSEA.

- Nov. 8.**—The Chemical Society. "Recent Investigations in the Chemistry of Gold." Professor C. S. Gibson. 6 p.m. University College, Swansea.

WORKINGTON.

- Nov. 8.**—West Cumberland Society of Chemists and Engineers. "Utilisation of Blast Furnace Gas." A. F. Webber. 7 p.m. Workington.

Weekly Prices of British Chemical Products

Current Market Conditions

THERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, pharmaceutical and photographic materials, perfumery chemicals and intermediates, but there have been a number of changes in the prices of coal tar products.

LONDON.—A large volume of inquiry is being received on the London market and conditions remain firm. Prices remain steady.

MANCHESTER.—Perhaps because of the slight improvement which continues to be reported in Lancashire cotton textile trade conditions and partly in sympathy with the better trade that is being experienced in other markets, the tone on the Manchester chemical market during the past week has been fairly cheerful. On the whole, however, apart from a somewhat steadier call for textile chemicals there has been no pronounced change so far in the general trading position. Deliveries are being fully maintained and there is a moderate flow of business in connection with spot and near positions. Although there is a growing interest in questions concerning contract renewals, this has not yet reached the stage of actual buying for the new lists in connection with 1936 deliveries of the leading products have not yet made their appearance. In the meantime, values are firm in most directions, including the majority of the by-products. In the case of the latter steady trading conditions are reported in several sections.

SCOTLAND.—There has been an improved demand for chemicals for home trade during the week, though export inquiries still remain limited. Prices generally continue very firm at about last week's figures, with only slight alterations to report. There has been a scarcity of glycerine supplies.

Coal and Tar Products

CREOSOTE.—B.S.I. specification, 5½d. per gal.
NAPHTHA, Solvent, 95/100.—1s. 7d. per gal.
NAPHTHALENE, purified crystals.—£11 15s. per ton.
PYRIDINE, 90/140.—5s. 6d. to 8s. per gal.
TOLUOL.—90%, 2s. 2d. to 2s. 3d. per gal.; pure, 2s. 6d.
XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 4d.

Essential Oils

BERGAMOT.—9s. per lb.
BOURBON GERANIUM.—23s. 9d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The price for November delivery is £7 5s. per ton, less 6s., neutral quality basis 20.6% nitrogen in 6-ton lots delivered to farmer's nearest station.

CALCIUM CYANAMIDE.—Prices for the remainder of the fertiliser year 1935/36 are: November £6 18s. 9d., December £7, January £7 1s. 3d., February £7 2s. 6d., March £7 3s. 9d., April/June, £7 5s., delivered in 4-ton lots.

NITRO-CHALK.—The price for the 1935/36 season is £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

NITRATE OF SODA.—The price for the 1935/36 season is £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

CONCENTRATED COMPLETE FERTILISERS.—£10 10s. to £10 19s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE (N.P.) FERTILISERS.—£10 5s. to £13 15s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

From Week to Week

THE 1936 ANNUAL MEETING of the Society of Chemical Industry will be held at Liverpool from July 6 to 10.

THE DEPARTMENT OF MINES of Canada has issued a booklet entitled "Analyses of Coals and other Solid Fuels," compiled by J. H. H. Nicolls and C. B. Mohr.

A SCHEME for establishing a Chemical Club at Manchester is being well supported by members of the local section of the Society of Chemical Industry and other chemical organisations in the area.

THE ERECTION OF TWO NEW OIL TANKS at Bowling, Dumbartonshire, for the Admiralty, is to begin shortly. Of a new design, they will be cone-shaped at the bottoms for the purpose of filtering and cleaning the oil before delivery into ships.

A FIRE OCCURRED on October 25 at the premises of Young-husband Barnes, and Co., oil refiners, Lower King and Queen Wharf, Rotherhithe. An official report states that five tanks containing 15 tons of linseed oil were damaged on the ground floor of a building of three floors, used as refinery, boiler house and store.

KEMBALL, BISHOP AND CO., LTD., Bromley-by-Bow, are engaged in the erection of a large seven-storey building for manufacturing citrate of lime and citric acid by the Pfizer process. Chas. Pfizer and Co., Inc., of New York, were the inventors of and the first firm in the world to use a fermentation process for this purpose on a large commercial scale.

SPEAKING TO MEMBERS of the South-Western District of the Incorporated Society of Inspectors of Weights and Measures at Plymouth on October 26, Mr. R. J. Trump, Board of Trade Controller of Standards, pointed out that the apparatus required for measuring the capacity of tanks was so expensive that garage proprietors had to take their oil and petrol on trust or use the highly unsatisfactory dip-stick.

THE ANNOUNCEMENT THAT BIRKENHEAD is to have a new industry was made at a meeting of the Birkenhead Town Council on October 23, when it was stated that Midland Tar Distillers, Ltd., is to erect works on corporation land at Ilchester Wharf. The company's works are at present at Queensferry, and it is understood that when they remove to Birkenhead a pipe-line will be laid through the town to connect the works with the corporation's gasworks to convey the tar produced at the gasworks. In addition, the company will import tar from other areas for distillation.

THE RUHR BENZIN CO. (Ruhr Petrol Co.), has just been formed to produce petrol from coal by the Fischer Tropsch process. About 80 per cent. of the Ruhr coal producers are participating in the new concern. In 1927 the Ruhr coal producers established the Ruhr Chemical Co., which produces nitrate from coal. The capacity of the new petrol company is estimated at 25,000 metric tons of petrol a year. Construction of the necessary plant has already begun and is expected to be completed by the end of 1936. The share capital of the new company is Rm.4,500,000. A credit of about Rm.25,000,000 will be granted by a banking syndicate headed by the Deutsche-Disconto Bank.

INTERNATIONAL COMBUSTION, LTD., report having received orders for England covering a 3 ft. by 8 in. Hardinge ball mill for grinding titanium; 3-roller standard high side Raymond mill for grinding raw gypsum; limestone plant including bunkers, feeder, elevators, Raymond separating plant, etc., for air separating limestone dust from a Hummer screen; Hardinge thickener-Rovac filter plant to deal with the clarification of river water; two 4 ft. by 14 ft. Tyrock, 3-deck, mechanically-operated screens for screening granite chippings; 4 ft. Andrews deslimmer to recover sand contained in effluent; 3 in. grit pump to deliver 12,000 gal. per hour containing 10 tons of sand; Ro-Tap testing sieve shakers for testing purposes. Orders for abroad include a 4 ft. 6 in. by 32 in. Hardinge ball mill for gold ore grinding and a No. 70 Raymond impact pulveriser for grinding Wonthaggi coal for P.F. firing.

THE ASSOCIATED LEARNED SOCIETIES of Liverpool and District held an "exhibition and soiree" in the Liverpool Technical College on October 26, when practically the whole of the college was given over to lectures, demonstrations, displays of industrial science, and exhibitions of the pursuits of the constituent bodies that form the association. The opening ceremony was performed by the Lord Mayor of Liverpool (Alderman F. T. Richardson) and the Vice-Chancellor of the University (Dr. H. J. W. Hetherington) presided. In over twenty rooms exhibits, working models and collections were on view with experts readily explaining them to visitors. Many firms had co-operated in the displays. The British Enka stand showed how artificial silk is spun, and in a comprehensive display by J. W. Towers and Co., Ltd., there were practical demonstrations by girl glass blowers. Pilkington Bros., Ltd., demonstrated armour plate glass. On the chemical side there were displays of a more specialised interest, including one by Mr. H. Emmett, showing the filming of crystal growth on the stand of the Society of Chemical Industry.

RONTGEN PUBLICITY, LTD., (260,545), 9a Sackville Street, W.1, has changed its name to X-Ray Engineers Association of Great Britain, Ltd.

THE SIXTH ANNUAL REPORT of the National Smoke Abatement Society has just been published. It states that the year under review has been one of the most satisfactory on record.

OWING TO THE GENERAL ELECTION on November 14, a joint meeting of the Liverpool sections of the Institute of Chemistry and the Society of Chemical Industry arranged for that date has been postponed until November 21.

THE JUBILEE MEMORIAL LECTURE of the Society of Chemical Industry will be delivered by Professor C. H. Desch on November 6, at 7.15 p.m., in the Chemistry Lecture Theatre of the University of Leeds. His subject will be "Metals in the Chemical Industry."

THE NATIONAL EMPLOYERS' MUTUAL GENERAL INSURANCE ASSOCIATION, LTD., has issued another booklet in its campaign for reducing accidents. The present work is entitled "Reducing Danger from Circular Saws" and contains a wealth of valuable information as to the most efficient means of safeguarding workmen engaged in their operation.

IN CONSTRUCTING A NEW RESERVOIR near Sheffield, the engineers decided to demolish an old weir on the River Derwent and to build a measuring channel instead. This channel is unique in that its masonry bed is covered with stainless steel sheet. The purpose of this stainless steel lining is to prevent the growth of moss and other vegetation which would choke the flow and induce errors in the measurements.

THE CHEMICAL ENGINEERING GROUP will hold its next meeting on November 15, at 8 p.m., in the rooms of the Chemical Society, Burlington House, Piccadilly, when a paper on "The Handling and Storing of Acids," by T. J. Dixon, B.Sc., and F. Roffey, B.Sc., Ph.D., will be read. The paper will deal with types of equipment for handling and storing acids in chemical works and for transport by rail and road.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BAKER'S PURE DRUG CO., LTD., London, S.W. (M., 2/11/35.) Reg. Oct. 21, £930 debts.; general charge. *—, Feb. 28, 1935.

Companies Winding-up Voluntarily

ALUMINIUM (II), LTD. (C.W.U.V., 2/11/35.) By special resolution October 21, Mr. Henry Charles Thomas, of 81 Summerlee Avenue, East Finchley, London, N.2, appointed liquidator. Creditors' claims by November 15 to the liquidator.

Latest Oil Prices

LONDON, Oct. 30.—LINSEED OIL was steady. Spot, £27 per ton (small quantities); Nov. and Dec., £24 10s.; Jan.-April, £24 12s. 6d.; May-Aug., £24 17s. 6d., naked. SOYA BEAN OIL was inactive. Oriental (bulk), Oct.-Nov. shipment, £23 10s. per ton. RAPE OIL was quiet. Crude extracted, £36 10s. per ton; technical refined, £38, naked, ex wharf. COTTON OIL was slow. Egyptian crude, £25 per ton; refined common edible, £29 10s.; and deodorised, £31 10s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was steady. American, spot, 45s. 3d. per cwt.

HULL.—LINSEED OIL, spot, quoted £25 2s. 6d. per ton; Oct. and Nov.-Dec., £24 12s. 6d.; Jan.-April, £24 15s.; May-Aug., £25. COTTON OIL, Egyptian, crude, spot, £26; edible, refined, spot, £29; technical, spot, £29; deodorised, £31, naked. PALM KERNEL OIL, crude, f.m.q., spot, £23 10s., naked. GROUND NUT OIL, extracted, spot, £34; deodorised, £37. RAPE OIL, extracted, spot, £35 10s.; refined, £37. SOYA OIL, extracted, spot, £28 10s.; deodorised, £31 10s. per ton. COD OIL, f.o.r. or f.a.s., 25s. per cwt., in barrels. CASTOR OIL, pharmaceutical, 45s. per cwt.; firsts, 40s.; seconds, 38s. TURPENTINE, American, spot, 47s. 3d. per cwt.

Chemical and Allied Stocks and Shares

Current Quotations

THE following table shows this week's Stock Exchange quotations of chemical and allied stocks and shares compared with those of last week. Except where otherwise shown the shares are of £1 denomination.

Name.	Oct. 29.	Oct. 22.	Name.	Oct. 29.	Oct. 22.
Anglo-Iranian Oil Co., Ltd. Ord.	63/9	61/4½	English Velvet & Cord Dyers' Association, Ltd. Ord.	3/9	3/9
" 8% Cum. Pref.	34/9	34/6	" 5% Cum. Pref.	7/6	8/9
" 9% Cum. Pref.	35/6	35/6	" 4% First Mort. Deb. Red. (£100)	£70	£70
Associated Dyers and Cleaners, Ltd. Ord.	2/6	2/6	Fison, Packard & Prentice, Ltd. Ord.	38/9	38/9
" 6½% Cum. Pref.	5/3¾	5/3¾	" 7% Non-Cum. Pref.	31/3	31/3
Associated Portland Cement Manufacturers, Ltd. Ord.	60/6	58/-	" 4½% Deb. (Reg.) Red. (£100)	£106	£106
" 5½% Cum. Pref.	27/-	27/-	Gas Light & Coke Co. Ord.	27/3	26/9
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6	" 3½% Maximum Stock (£100) ...	£90	£90
Berger (Lewis) & Sons, Ltd. Ord.	61/3	61/3	" 4% Consolidated Pref. Stock (£100)	£106/10/-	£106/10/-
Bleachers' Association, Ltd. Ord.	6/10½	6/3	" 3% Consolidated Deb. Stock, Irred. (£100)	£86/10/-	£85
" 5½% Cum. Pref.	11/3	10/-	" 5% Deb. Stock, Red. (£100) ...	£116	£116
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-	" 4½% Red. Deb. Stock (1960-65) (£100)	£114	£114
Boots Pure Drug Co., Ltd. Ord. (5/-)	48/6	47/9	Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	13/1½	13/1½
Borax Consolidated, Ltd. Pfd. Ord. (£) ...	97/6	97/6	" 7% Prefd. Ord. (10/-)	13/1½	13/1½
" Defd. Ord.	17/6	16/9	" 7% Cum. Pref.	30/-	30/-
" 5½% Cum. Pref. (£100)	£11	£11	Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
" 4½% Deb. (1st Mort.) Red. (£100)	£109	£109	" 6½% Cum. Pref.	28/9	28/9
" 4½% 2nd Mort. Deb. Red. (£100)	£104	£104	Imperial Chemical Industries, Ltd. Ord. ...	35/3	35/3
Bradford Dyers' Association, Ltd. Ord. ...	9/4½	8/9	" Deferred (10/-)	8/6	8/6
" 5% Cum. Pref.	12/6	11/10½	" 7% Cum. Pref.	33/-	32/6
" 4% 1st Mort. Perp. Deb. (£100)	£88	£88	Imperial Smelting Corporation, Ltd. Ord.	15/3	15/6
British Celanese Ltd., 7% 1st Cum. Pref.	24/6	24/9	" 6½% Pref. (Cum.)	24/3	24/3
" 7½% Part. 2nd Cum. Pref.	21/6	22/-	International Nickel Co. of Canada, Ltd. Cum.	\$31½	\$31½
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/6	5/3	Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
" 4% 1st Mort. Deb. Red. (£100)	£90	£90	" 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
British Cyanides Co., Ltd. Ord. (2/-)	3/-	3/-	Laporte, B., Ltd. Ord.	116/3	116/3
British Drug Houses, Ltd. Ord.	18/9	20/-	Lawes Chemical Co., Ltd. Ord. (1/-)	6/3	6/3
" 5% Cum. Pref.	21/3	21/3	" 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
British Glues and Chemicals, Ltd. Ord. (4/-)	6/9	6/3	Lever Bros., Ltd. 7% Cum. Pref.	32/-	31/3
" 8% Pref. (Cum. and Part.) ...	28/1½	27/6	" 8% Cum. "A" Pref.	32/-	31/3
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	46/10½	46/3	" 20% Cum. Prefd. Ord.	76/6	76/10½
" 5½% Cum. Pref.	26/3	26/3	" 5% Cons. Deb. (£100)	£106	£106
" 4½% First. Mort. Deb. Red. (£100)	£106/10/-	£106/10/-	" 4% Cons. Deb. (£100)	£133	£103
British Oxygen Co., Ltd. Ord.	107/6	107/6	Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
" 6½% Cum. Pref.	32/6	32/6	" 6% 2nd Pref. (5/-)	6d.	6d.
British Portland Cement Manufacturers, Ltd. Ord.	105/-	96/3	" 6% 1st Deb. (Reg.)	£40	£40
" 6% Cum. Pref.	29/6	29/-	Major & Co., Ltd. Ord. (5/-)	7½d.	4½d.
Bryant & May, Ltd. Pref.	66/3	66/3	" 8% Part. Prefd. Ord. (10/-) ...	9d.	9d.
Burt, Boulton & Haywood, Ltd. Ord.	18/9	17/6	" 7½% Cum. Pref.	1/6½	11½d.
" 7% Cum. Pref.	27/6	27/6	Finch, Johnson & Co., Ltd. Ord. (10/-)	42/-	42/-
" 6% 1st Mort. Deb. Red. (£100)	£105/10/-	£105/10/-	" 1st Pref. 6½% Cum.	30/-	30/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	108/9	108/9	Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£68/10/-	£68/10/-
" 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-	Reckitt & Sons, Ltd. Ord.	109/4½	108/1½
Calico Printers' Association, Ltd. Ord. ...	8/9	8/9	" 4½% Cum. 1st Pref.	25/-	25/-
" 5% Pref. (Cum.)	13/9	12/6	Salt Union, Ltd. Ord.	40/-	40/-
Cellulose Acetate Silk Co., Ltd. Ord.	13/9	13/1½	" Pref.	46/3	46/3
" Deferred (1/-)	2/1½	2/4½	" 4½ Deb. (£100)	£109/10/-	£109/10/-
Consett Iron Co., Ltd. Ord.	9/3	10/6	South Metropolitan Gas Co. Ord. (£100)	£130/10/-	£123/10/-
" 8% Pref.	27/6	27/6	" 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
" 6% First Deb. stock, Red. (£100)	£106	£106	" 4% Pref. (Irred.) (£100)	£107	£107
Cooper, McDougal & Robertson, Ltd. Ord.	32/6	32/6	" Perpetual 3% Deb. (£100)	£85	£85
" 7% Cum. Pref.	28/9	28/9	" 5% Red. Deb. 1950-60 (£100)	£115/10/-	£115/10/-
Courtaulds, Ltd. Ord.	53/1½	53/9	Staveley Coal & Iron Co., Ltd. Ord.	46/3	46/3
" 5% Cum.	24/4½	24/4½	Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	27/6
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre Pref.	25/-	25/-	Triplex Safety Glass Co., Ltd. Ord. (10/-)	80/-	76/10½
" Cum. 6% Pref.	28/9	28/9	Unilever, Ltd. Ord.	31/3	30/-
" 6½% Cum. Pref.	29/4½	29/4½	" 7% Cum. Pref.	28/-	27/9
" 7½% "A" Cum. Pref.	30/-	30/-	United Glass Bottle Manufacturers, Ltd. Ord.	40/-	39/6
Distillers Co., Ltd. Ord.	92/6	92/-	" 7½% Cum. Pref.	33/-	33/-
" 6% Pref. Stock Cum.	31/6	31/-	United Molasses Co., Ltd. Ord. (6/8)	18/9	18/9
Dorman Long & Co., Ltd. Ord.	18/6	19/6	" 6% Cum. Pref.	25/-	25/-
" Pref. Ord.	26/10½	27/6	United Premier Oil & Cake Co., Ltd. Ord. (5/-)	8/3	7/6
" 6½% Non-Cum. 1st Pref.	23/3	23/-	" 7% Cum. Pref.	24/4½	24/4½
" 8% Non-Cum. 2nd Pref.	19/3	19/6	" 6% Deb. Red. (£100)	£101	£101
" 4% First Mort. Perp. Deb. (£100)	£102/10/-	£102/10/-			
" 5% 1st Mort. Red. Deb. (£100)	£103	£103			

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Methyl Chloride

METHYL chloride is made by heating methanol and hydrogen chloride to 100–200° C., in a body of zinc chloride solution, the methanol being in excess. The zinc chloride solution may be of 45–75 per cent. strength. The methanol may be caused to dissolve in the zinc chloride solution before the hydrogen chloride is introduced. In an example a zinc chloride solution of 68 per cent. is heated to 125° C., and methanol is allowed to flow in through a heat-insulated inlet tube opening in the lower third of the vessel. Hydrogen chloride is introduced through a sieve plate at the bottom. Crude synthetic methanol may be employed as starting material. (See Specification 427,738, of J. Y. Johnson.)

Vinyl Formate

VINYL formate is manufactured by heating a vinyl ester of an acid containing more than one carbon atom with formic acid, preferably in the presence of a salt of a heavy metal as catalyst, especially a mercury salt which is advantageously used in the presence of a mineral acid. The mercury salt may be produced *in situ*, the presence of a mineral acid being secured by using a quantity thereof in excess of that required for forming the salt. In examples: (1) vinyl acetate and formic acid are heated together with the addition of mercuric oxide and phosphoric acid; (2) the phosphoric acid is replaced by sulphuric acid. The reaction may be carried out in the presence of an antioxidant, e.g. hydroquinone. (See Specification 425,673, of Consortium Fur Elektrochemische Industrie Ges.)

Stabilising Formaldehyde Solutions

AQUEOUS solutions of formaldehyde are stabilised by adding hydrogen in a proportion appreciably less than an approximate saturation, preferably 5–10 per cent. by weight of the formaldehyde solution. The stabilising effect is not appreciably affected by small changes in acidity, the stabiliser being effective in the pH range of 2–8. Hydrogen sulphide may be used in conjunction with other stabilisers, e.g. methyl or ethyl alcohol. An example describes the effect of adding various amounts of hydrogen sulphide and, for purposes of comparison, various amounts of methyl alcohol to a 37 per cent. aqueous formaldehyde solution containing 0.5 per cent. of methyl alcohol. (See Specification 427,423, of E. I. Du Pont Nemours and Co.)

Dyes from Natural Products

A COLOURING material for foodstuffs consists of haemoglobin from animal blood treated with nitrites or nitrates or both, the sodium or potassium salts being preferably used, and then dehydrated. The blood may first be defibrinated, e.g. by agitating it violently for 5–10 minutes and skimming off the fibrous mass which rises to the surface, and the haemoglobin is preferably separated from the blood serum, albuminous matter and a part of the aqueous content, e.g. by centrifuging. The nitrites and nitrates may be mixed with a diluent salt such as sodium chloride. In an example, 5 ozs. of a mixture of 5 parts of sodium nitrite, 1½ parts of sodium nitrate and 93½ parts of sodium chloride are added to 100 lbs. of fresh warm blood which is agitated strongly for about 10 minutes and allowed to stand for about 2 hours, preferably at 70° F. The product is next chilled to about 36–42° F. and kept at this temperature until a bright red colour develops, usually in 24–48 hours. The material is then dried in a vacuum pan or by spraying into heated air, giving a bright red powder. (See Specification 425,567, of H. E. Allen and A. G. McCaleb.)

Specifications open to Public Inspection

CHLORETHYL CHLORO-ETHOXY-ETHYL ETHER.—Carbide and Carbon Chemicals Corporation. April 17, 1934. 10188/35.

INDIGOID DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. April 20, 1934. 11122/35.

SYNTHETIC RESINS, production.—Naamlooze Vennootschap Industriële Maatschappij Voorheen Noury and Van der Lande. April 18, 1934. 11171/35.

INDIGOID DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. April 21, 1934. 11244/35.

CUPRIFEROUS AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. April 17, 1934. 11601/35.

AZO DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. April 19, 1934. 11875/35.

4-HYDROXYPYRENE, manufacture.—I. G. Farbenindustrie. April 19, 1934. 12185/35.

PROCESS FOR SAPONIFYING MATERIALS made from cellulose esters. Aceta Ges. April 21, 1934. 12186/35.

1-PHENYL-3-METHYL-PYRAZOLONE-5 and related compounds, preparation.—Carbide and Carbon Chemicals Corporation. April 21, 1934. 11497/35.

Specifications Accepted with Date of Application

SULPHONIC ACID and carboxylic acid derivatives of 1:1'-diaryl-3:3'-arylene-5:5'-bis-pyrazolones, manufacture.—I. G. Farbenindustrie. March 11, 1933. 436,789.

HEAVY METAL COMPLEX COMPOUNDS of azo dyestuffs, process for manufacture.—A. Carpmal (I. G. Farbenindustrie). April 5, 1934. 436,588.

HYDROCARBONS or derivatives thereof, production.—K. S. Jackson, G. E. Wainwright, H. R. Hailes, and Imperial Chemical Industries, Ltd. April 6, 1934. 436,653.

PHOSPHATIDE PREPARATIONS, production.—Hanseatische Mühlenwerke A.-G. June 8, 1933. 436,859.

QUATERNARY AMMONIUM COMPOUNDS, manufacture.—I. G. Farbenindustrie. April 13, 1933. 436,793.

NAPHTHALENE DERIVATIVES, manufacture.—Imperial Chemical Industries, Ltd., R. P. Linstead and E. F. Bradbrook. April 16, 1934. 436,661.

NAPHTHYLAMINE DERIVATIVES, manufacture.—Imperial Chemical Industries, Ltd., and W. B. McKay. April 18, 1934. 436,805.

METHYLAMINE MIXTURES, distillation.—E. I. du Pont de Nemours and Co. April 19, 1933. 436,874.

CELLULOSIC MATERIALS, saccharification.—H. Dreyfus. April 20, 1934. 436,877.

MIXED ESTERS of polyhydric alcohols and of carbohydrates, production.—E. I. du Pont de Nemours and Co. April 20, 1933. 436,885.

LEADED AMMONIUM CHLORIDE CRYSTALS, manufacture.—Grasselli Chemical Co. April 20, 1933. 436,886.

AMINONITRILES, production.—Ges. für Kohlentechnik. Sept. 21, 1933. 436,692.

CATALYTIC OXIDATION of unsaturated alcohols.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. April 18, 1934. 436,840.

Applications for Patents

(October 3 to 9 inclusive).

CARBONYL COMPOUNDS, production.—H. D. Elkington (Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij). 27682.

HALOGENATED DERIVATIVES OF METHANE, manufacture.—W. W. Gleave and Imperial Chemical Industries, Ltd. 27818.

MONOAZO DYESTUFFS, manufacture.—W. W. Groves (Geigy A.-G.). 27473.

METALLIFEROUS AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Jan. 31.) 27316.

CONDENSATION PRODUCTS, manufacture.—I. G. Farbenindustrie. (Germany, Nov. 9, '34.) 27317.

POLYMERISATION PRODUCTS, manufacture.—I. G. Farbenindustrie. (Germany, Oct. 6, '34.) 27319.

COMPLEX COMPOUNDS of 1,3-dimethylxanthene, manufacture.—I. G. Farbenindustrie. (Germany, Oct. 4, '34.) 27323.

ALKALINE EARTH METAL CHLORATES, manufacture.—Imperial Chemical Industries, Ltd. 27816.

CHLORINATED RUBBER, manufacture.—Imperial Chemical Industries, Ltd., A. P. Lowes and T. N. Montgomery. 27817.

SILICA BRICKS, ETC., manufacture.—H. Koppers' Industrielle Maatschappij Naamlooze Vennootschap. (Germany, Oct. 3, '34.) 27332.

AMINES, manufacture.—W. A. Lazier. 27691.

PRODUCTION OF SULPHUR by reduction of sulphur dioxide.—A. R. Lindblad. 27291.

HYDROGENATION CATALYSTS, revivification.—E. B. Maxted and Yorkshire Tar Distilleries, Ltd. 27260.

HALOGENATED PHENANTHROLINES, preparing.—Naamlooze Vennootschap Nederlandsche Kininefabriek. (Holland, Dec. 22, '34.) 27268.

SALTS, manufacture.—Norsk Hydro-Elektrisk Kvaelfstofaktieselskab. (Norway, Oct. 10, '34.) 27455.

TITANIUM DIOXIDE, manufacture.—J. E. Pollak (Naamlooze Vennootschap Industriële Maatschappij voorheen Noury and Van der Lande). 27791.

BENZINE, production.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). 27730.

DISTILLING TAR, process.—O. Reynard. 27752.

CATALYTIC HYDROGENATION, apparatus.—Soc. Industrielle des Carburants et Solvants. (France, Oct. 5, '34.) 27412.

ABSORPTION OF NITROUS GASES, process.—Bamag-Meguinn A.-G. (Germany, Jan. 19.) 27982.

ACYLATED DERIVATIVES, manufacture.—E. Berl. 27950.

ACID CHLORIDES, manufacture.—E. Berl. 27951.
 MIXED ACID ANHYDRIDES, manufacture.—E. Berl. 27952
 ETHYL ALCOHOL, manufacture.—E. Berl. 27953.
 CELLULOSE FIBRES, dyeing.—E. Berl. 27954.
 AMMONIUM SALTS, manufacture.—E. Berl. 27955.
 SEPARATING MAGNESIUM, ETC.—H. A. Blackwell. 28058.
 ESTERS, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 28124.
 ORGANIC COMPOUNDS, manufacture—British Celanese, Ltd. 28007.
 ACID COMPOUNDS, manufacture.—A. Carpmal (I. G. Farbenindustrie). 28150.
 ADDITION OF HYDROGEN HALIDES to aryl ethylenes.—A. Carpmal (I. G. Farbenindustrie). 28151.
 POTASSIUM SULPHATE, manufacture.—I. L. Clifford and Imperial Chemical Industries, Ltd. 28021.
 VINYL COMPOUNDS, manufacture.—Coutts and Co. (I. G. Farbenindustrie) 27993.
 WATER CHLORINATION APPARATUS.—B. M. Hills. and F. Howles. 28087.
 ISOBUTYLENE, preparation and polymerisation.—G. F. Horsley and Imperial Chemical Industries, Ltd. 28166.
 AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Dec. 21, '34.) 27976.
 POLYMERISATION PRODUCTS of 2-chlorobutadiene-1,3, manufacture.—I. G. Farbenindustrie. (Germany, Oct. 13, '34.) 28146.
 SULPHUR, manufacture.—I. G. Farbenindustrie. (Germany, Oct. 20, '34.) 28206.
 DEPOLARISING COMPOSITIONS from native manganese dioxide, production.—I. G. Farbenindustrie. (Germany, Dec. 24, '34.) 28362.
 NEW OXYKETONES, ETC., manufacture.—Soc. of Chemical Industry in Basle. 28230.

(October 17 to 23 inclusive.)

TITANIUM DIOXIDE, treatment.—American Zinc, Lead and Smelting Co. (United States, Nov. 5, '34.) 29107.

SYNTHETIC RESINS, manufacture.—D. G. Anderson. 28950.
 INDIGOID DYESTUFFS, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 29135.
 ESTERS, preparation.—Carbide and Carbon Chemicals Corporation. (United States, Oct. 26, '34.) 28791.
 AZO DYESTUFFS, manufacture.—A. Carpmal (I. G. Farbenindustrie). 28731.
 POLY-AZODYESTUFFS, manufacture.—A. Carpmal (I. G. Farbenindustrie). 29283.
 DISAZODYESTUFFS, manufacture.—A. Carpmal (I. G. Farbenindustrie). 29284.
 HYDROGENATION OF COAL, ETC., apparatus.—Compagnie de Bethune. (France, Oct. 22, '34.) 29176.
 PRODUCING DYEINGS on cellulose esters.—J. R. Geigy A.-G. (Germany, Nov. 3, '34.) 28716.
 AROMATIC CARBOXYLIC ACID CHLORIDES, manufacture.—W. W. Groves (I. G. Farbenindustrie). 29136.
 ANTHRAQUINONE DYESTUFFS.—N. H. Haddock and Imperial Chemical Industries. 29046.
 SULFONATING HIGHER ALIPHATIC CARBOXYLIC ACIDS.—Hansawerke Lärman, Schütte and Co. (Germany, Oct. 18, '34.) 28760.
 POLYMERISATION PROCESS.—R. Hill and Imperial Chemical Industries, Ltd. 29318.
 COMPOUNDS OF THE ANTHRACENE SERIES, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 29247.
 TRANSPARENT CELLULOSE FORMATE PRODUCTS, manufacture.—R. Koepf and Co. Chemische Fabrik A.-G. (Germany, Oct. 22, '34.) 29149.
 CATALYTIC PROCESSES, apparatus.—E. Lush. 29729.
 ACTIVATING TREATMENTS of bentonites and subbentonites for filtering, etc., properties. E. McKellar. 28990.
 PROCESS OF PRODUCING CATALYTIC MATERIAL for chemical reactions.—A. L. Mond (Universal Oil Products Co.). 28769.
 DYESTUFFS of the anthraquinone series, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, Nov. 13, '34.) 29262.
 DEWAXING HYDROCARBON OIL.—Texaco Development Corporation. (United States, Jan. 11.) 29124.

Company News

British Match Corporation.—An interim of 2½ per cent., less tax, has been declared on the ordinary shares for the year to April 30 next. This compares with an interim last year of 2 per cent., tax free, which was followed by a final dividend of 4 per cent., tax free, making 6 per cent., tax free, the same as for a number of years.

British Plaster Board.—Payment will be made on December 1, of an interim dividend of 20 per cent., less tax. This compares with 15 per cent. paid last year, when the final dividend was 25 per cent. The present distribution is payable on a capital increased from £208,000 to £615,400 by an issue of shares in connection with the amalgamation with Gotham Co. and Gypsum Mines.

Eastern Chemical Co.—The report for the year to March 31 last shows profit, after providing for depreciation of motor vehicles and furniture, etc., £221 (against loss £5,056), which, deducted from debit £51,692 brought in, leaves debit balance of £51,471 to go forward. No depreciation has been written off buildings and plant this year as directors consider that depreciation reserve, which now stands at £25,058, is adequate.

North British Rayon Co.—For the year to June 30 last the report shows that the gross trading profit is up from £28,256 to £39,451. After allowing for depreciation and fees and deducting interest payments of £10,572, the balance is £14,689; a sum of £1,412 is written off patents account, £2,000 off research account and £1,760 off note issue expenses, leaving £28,490 to go forward, against £18,974 brought in.

North Broken Hill, Ltd.—For the year to June 30 last the report states that mine production rose from £792,721 to £991,460, and expenses were £560,370, against £522,832, leaving the working profit £161,201 higher at £431,090. Taxes and royalties absorb £90,000, against £40,000, and £30,000 is again allowed for depreciation, leaving a net profit of £390,684, against £273,355. Dividends amounting to 40 per cent. charged in the accounts absorb £280,000, and after making appropriations for new plant, the balance is £503,181.

Electrolytic Zinc Co. of Australasia.—For the year to June 30 last, after the transfer of £145,000 for depreciation, the gross profit totalled £327,960 Australian currency. This is an increase of over £42,000 on the 1933-34 figure of £285,732, which was arrived at after a similar depreciation transfer. Net profit, after taxes, etc., rose from £234,798 to £256,020. A sum of £23,600 is carried to the credit of Debenture sinking fund and £25,000 allocated towards development and new plant for the West Coast Mines. Dividend No. 26 was paid on September 10, absorbing £115,000. This covered the preference dividend for the half-year ended June 30, 1935, and also the dividend on the ordinary shares at 5 per cent. per annum for the year ended June 30, against 4 per cent. for the previous year.

Lewis Berger and Sons.—A final dividend of 9 per cent., less tax, is announced on the ordinary shares, making 15 per cent., less tax, for the year ended July 31 last. This is 5 per cent. more than a year ago, when 10 per cent. was distributed. In 1932-33 7½ per cent. was paid, against 5 per cent. the previous year.

Minerals Separation.—An interim dividend of 10 per cent., less tax, has been declared payable on November 11. For the past four years the half-yearly payment has been 5 per cent., followed each time by a final distribution of 10 per cent. The directors point out that shareholders should not assume that there will be a larger final distribution than that of last year.

Shawinigan Water and Power.—A statement of earnings and expenses for nine months ended September 30, 1935, shows gross revenue, \$9,433,406 (against \$8,962,677 for the corresponding period 1934); net revenue, \$5,339,492 (against \$5,244,201); fixed charges, \$3,020,207 (against \$2,949,402); surplus (before depreciation and income-tax), \$2,319,285 (\$2,294,799). The directors have declared a dividend on the common shares of the company for the quarter ended September 30, 1935, of 12 cents.

Scottish Agricultural Industries, Ltd., which is controlled by Imperial Chemical Industries, Ltd., announces a dividend of 2½ per cent., less tax, on the ordinary shares for the year to June 30 last. This is the first payment on these shares since 3 per cent. was paid for the initial period to June 30, 1929. Dividends declared by subsidiary companies amounted to £65,469, compared with £44,672 the previous year. A sum of £2,353 is placed to general reserve, and, after allowing £2,313 for tax, the carry-forward is raised from £2,516 to £8,129.

E. I. Pont De Nemours.—A statement for the three months to September 30, 1935, shows operating income \$14,072,344, provision for depreciation and obsolescence \$3,698,523, giving income \$10,373,821, to which is added income from investment in General Motors Corporation \$7,498,085, and other income \$1,316,158, making a total income of \$19,188,664, less Federal taxes \$1,469,695, and interest \$14,187, leaving net income \$17,704,182. Debenture interest absorbed \$1,639,396, leaving \$16,064,786 to be carried forward.

British Celanese, Ltd.—Trading profit for the year to June 29, amounts to £2,350,491, against £2,593,028, but after including other receipts and allowing for expenses, duty, adjustment of stock values, research and advertising, etc., there is a balance of £1,156,881, against £1,068,747. The depreciation provision is £304,000, against £287,462, and after providing for £61,142 written off commutation of royalties and debenture interest and premium on redemption of the 7 per cent. stock, there is a net profit before tax of £576,138 in comparison with £446,008 a year ago, an increase of £130,130. Last year's figure included £13,602 tax pro-

vision not required, and there was in addition a surplus on realisation of investments of £175,951. Provision for depreciation for four years, totalling £1,014,940, was made. From this year's profits, £25,000 is written off underwriting commission, and £133,000 is provided for tax. After providing for the two-and-a-half years' preference arrears charged to the year's accounts, £260,692 is carried forward.

American Smelting & Refining Co.—The net income for the first half-year was \$4,321,967 (against \$3,988,801); to this is added profit on inventories in excess of normal, \$740,882 (\$274,775), giving total income of \$5,062,850 (compared with \$4,263,577). This income is equivalent to an annual rate of \$3.02 per share on the common stock. After allowing for the preferred stock dividends, comparable rate for 1934 was \$2.14 per share. Regular dividends were paid on the 7 per cent. cumulative preferred stock, and \$7.50 per share, totalling \$1,380,000, on the 6 per cent. cumulative second preferred stock. Also, there was declared another dividend on the second preferred stock of \$6 per share, or \$1,104,000, which was paid on August 31. On October 1 the board declared regular dividend on the 7 per cent. cumulative preferred stock; also \$6.50 per share on the 6 per cent. cumulative preferred stock. Payment on December 2 will pay all dividends on both classes of preferred stock up to September 30, 1935. No dividends have been paid on the common stock since February 1, 1932.

New Companies Registered

Fuel Conversion, Ltd., 82 King William Street, E.C.—Registered October 17. Nominal capital £100. Manufacturers of and dealers in patent fuel and coke, carbonisers and distillers of coal, shale and other substances, manufacturers of gas, motor spirit, naphtha, oils, dyes, etc. A subscriber: Edwd. A. McNeill.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

British Malaya.—A firm of electrical and mechanical engineers established at Singapore wishes to obtain the representation, on a commission or consignment basis, of United Kingdom manufacturers of heavy oil engines, pumps, and anti-corrosive paint. The firm would be prepared to purchase ready selling lines for stock. (Ref. No. 388.)

Northern Ireland.—An agent in Belfast desires to obtain the representation for Northern Ireland, on a commission basis, of United Kingdom manufacturers of stainless steel. (Ref. No. 393.)

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LONDON, W.1

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Books Received

Physical Aspects of Organic Chemistry. By William A. Waters. London: George Routledge and Sons, Ltd. Pp. 500. 25s.

Dry Cleaners' Handbook. By F. R. Baker and A. P. Anderson. London: Shepherd and Hosking, Ltd. Pp. 126. 3s. 6d.

The Gas Supply of Glasgow. Glasgow: John Menzies & Co., Ltd.

Physical Principles and Applications of Magnetochemistry. By S. S. Bhatnagar and K. N. Mathur. London: Macmillan. Pp. 376. 21s.

Sutton's Systematic Handbook of Volumetric Analysis. 12th Edn. Revised by A. D. Mitchell. London: J. & A. Churchill, Ltd. Pp. 632. 35s.

The Systematic Identification of Organic Compounds. A Laboratory Manual. By Ralph L. Shriner and Reynold C. Fuson. London: Chapman and Hall, Ltd. Pp. 196. 11s.

General Chemistry. By Horice G. Deming. London: Chapman and Hall, Ltd. Pp. 770. 17s. 6d.

The Structure of Metallic Coatings, Films and Surfaces. A General Discussion held by the Faraday Society. September, 1935. London: Garney & Jackson. Pp. 250. 21s.

Dry-Cleaning with "Triklone." London: Imperial Chemical Industries, Ltd. Pp. 54. 2s.

Life and Experiences of a Bengali Chemist. Vol. 11. By Prafulla Chandra Ray. London: Kegan Paul, Trench, Trubner & Co., Ltd. Pp. 470. 6s.

Insect Pests of Glasshouse Crops. By Herbert W. Miles and Mary Miles. Surbiton, Surrey, England: H. C. Long. Pp. 174. 8s. 6d.

Analytical Chemistry. Based on the text of F. P. Treadwell, by William T. Hall. Vol. 11. Quantitative Analysis. London: Chapman & Hall, Ltd. Pp. 858. 30s.

Exercises in General Chemistry and Qualitative Analysis. By Horace G. Deming and Saul B. Arenson. London: Chapman & Hall, Ltd. Pp. 326. 9s.

Fluorescence Analysis in Ultra-Violet Light. By J. A. Radley and Julius Grant. Second Edition. London: Chapman & Hall, Ltd. Pp. 326. 21s.

The Theory of Emulsions and their Technical Treatment. By W. Clayton, D.Sc., F.I.C. London: J. & A. Churchill, Ltd. Pp. 458. 25s.

Kelly's Directory of the Chemical Industries, 1935. London: Kelly's Directories, Ltd. Pp. 1136. 36s.

Official Publications

The National Physical Laboratory. Collected Researches. Vol. XXV. 1935. Metallurgy. London: H.M. Stationery Office. Pp. 432. £1 5s.

Economic Conditions in Canada (1934-1935). Report by F. W. Field. London: H.M. Stationery Office. Pp. 167. 4s.

Review of Oxidation and Scaling of Heated Solid Metals. London: H.M. Stationery Office. Pp. 104. 2s. 6d.

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